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# FEASIBILITY STUDY FOR LEUPP INDUSTRIAL PARK



CONTRACT NO. 4-36317

PROJECT NO. 07-6-01433



FEBRUARY, 1976



GORDON HERKENHOFF & ASSOCIATES, INC.

302 Eighth Street, N. W. Albuquerque, New Mexico 87102



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A Technical Assistance Study Prepared for Economic Development Administration,

U. S. Department of Commerce

FEBRUARY, 1976

This technical assistance study was accomplished by professional consultants under contract with the Economic Development Administration. The statements, findings, conclusions, recommendations, and other data in this report are solely those of the contractor and do not necessarily reflect the views of the Economic Development Administration.



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CHAPTER I

SUMMARY AND CONCLUSIONS



### A. INTRODUCTION:

The question of feasibility of a Leupp Industrial Park cannot be treated by methods normally applied to the feasibility of private ventures. Implementation of the Leupp Industrial Park must be viewed as a public expenditure aimed at improving the local economic base in order to <a href="mailto:create">create</a> feasible conditions for a private enterprise.

Once this has been accomplished, when Leupp has been adequately readied for promotion as an industrial location, the question of successfully competing with over 16,000 other industrial parks in the U.S.A. for a mere 600 or so annual industrial expansions or relocations, will depend on the quality of the promotion program used, on special incentives offered by the Navajo Tribe and on the adequacy of Leupp resources other than the industrial park.

Every industrial firm, when seeking a location for a plant, evaluates not only transportation factors and physical resources but increasingly emphasizes adequate labor availability and community amenities. As an example, most companies characteristically want a trainable, low cost and non union labor pool three to four times larger than its employee needs. It is consequently inadequate to identify a sufficiently large number of unemployed Navajos within 200 miles of Leupp; since a prospective employer needs them in Leupp he will invariably evaluate not only the area's but also the community's capacity of providing adequate labor.

Hewlett Packard, during their stay at Leupp, estimated that no more than 100 employees could be drawn from the local commuting labor pool before labor relocation and housing requirements would create a problem. For these reasons, the basic question is not, as mentioned, "is an industrial park at Leupp feasible," but rather, "under what conditions is a Leupp Industrial Park feasible and what must be done to bring about such conditions there?"

### B. OBJECTIVES:

Hence, the objectives of this report are:

- To identify and evaluate the industrial resources in the Leupp area;
- To indicate the types of industrial firms compatible with local resources;
- To propose an industrial park design which can serve such industries well;
- 4. To estimate needs for transportation and utility improvements external to the park in order that the park be adequately served:
- 5. To evaluate minimum facilities required to enhance Leupp as an industrial support community which can make all area resources available to an employer at the park;
- 6. To estimate total cost of improvements needed to make Leupp competitive and:

7. To evaluate potential returns to the Navajo Tribe as a result of employment at the Leupp Industrial Park.

### C. CONCULSIONS:

After careful analysis of each of the problem areas listed above, it is the opinion of this report that:

- Without the total set of infrastructure improvements as suggested in this report, Leupp cannot succeed as an attraction for industrial location.
- Leupp can, however, become one of the more attractive industrial locations in the Southwest provided the total of said infrastructure improvement programs are in fact implemented,
- Under normal conditions, with full application of special Navajo location incentives and with a well performed promotion program, Phase I of the Leupp Industrial Park should accomplish a 30% occupancy (300 jobs) by 1980 and a 60% occupancy (600 jobs) by 1985.
- With the employment levels in the Leupp Industrial Park as stipulated above, direct benefits should be at least \$7,000,000 over the first four years of operation, while costs (park development, industrial building, pre-job and OJT subsidies) would be around \$4,200,000, with a benefit cost ratio of 1.69 and an internal rate of return exceeding 20% per year.

Detailed underpinnings for these conclusions are contained throughout the analysis found in Chapters II - X of this report. A brief synopsis of the findings and recommendations of the report follows:

### D. SYNOPSIS:

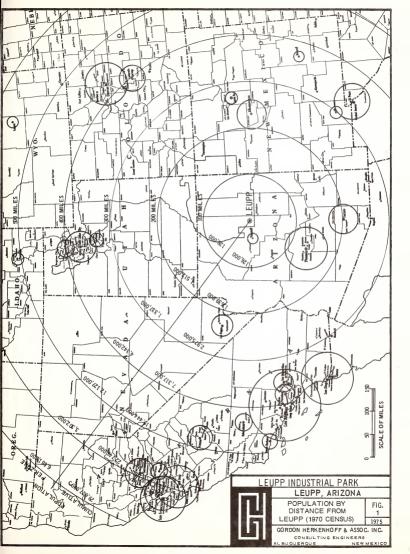
1. <u>Development at Leupp</u>. The central developments at Leupp consist of BIA boarding and day school, an Arizona Public Elementary school, The Leupp Chapter House Complex including the Chapter House itself, a free food program distribution warehouse, a Navajo Co-op store and a wool collection facility.

In addition, there are two trading posts located one and two miles to the east of the Chapter House Complex, three churches within two miles of the same complex and an El Paso Natural Gas compressor station six miles to the west.

Two natural gas pipelines, El Paso Natural Gas and TransWestern go through the settlement and Navajo Route 15 to Flagstaff (45 miles) and Arizona Highway 99 to Winslow (25 miles) provide ground transport to the Nation's Interstate System and the AT & SF Railroad.

The Leupp population of 925 is scattered in the area surrounding the central developments and the Leupp Chapter as a whole is no more densely populated than the rest of the Reservation.

The relative dispersion of the settlement precludes community wide utility systems. Utilities therefore serve only the schools, the Chapter House Complex and one of the churches, and local capacities are inadequate for industrial development.



### 2. Labor Force.

Within Commuting Distance	1,295
Relocation Necessary	16,705
TOTAL	18 000

Of semi-nomadic background, the Navajo has always shown a willingness to relocate when economic conditions so specify. Since it is unrealistic to expect that the entire labor force within commuting distance will seek employment at Leupp, some outside labor will always be in demand and new housing developments will be needed for relocated families.

A minimum level of community development, therefore, becomes a necessity in order to make the area labor force truly available to prospective industries.

### 3. Resources and Other Location Advantages.

- a. A large, available, non-union and trainable labor pool.
- b. No property or inventory taxes and location in a free port zone.
- c. Low wage rates.
- d. Pre-job and on-the-job training subsidies.
- e. Excellent lease arrangement with the Navajo Tribe.
- f. Central market location for distribution in the Southwest.

- 4. Markets and Distances. Leupp is excellently well located for a firm that distributes in the Southwest, the Midwest and on the West Coast. The town lies about equidistant between the coastal and midwestern markets and road and rail delivery times are good; there were 20 million people within 500 miles and 33 million people within 800 miles of Leupp in 1970.
- 5. <u>Competitive Developments</u>. In Leupp's immediate, competitive area a one hundred mile radius not even Flagstaff can be called an industrial concentration; all local economies surrounding Leupp rely on the transporation, trade, services and government sectors for most of their employment.

Available labor pools in the surrounding communities are small and the only developed industrial park which can diminish Leupp's competitive position in the area is the Hopi Indian Industrial Park at Winslow only 25 miles from Leupp. (See Chapter VI, for a discussion of this problem.)

6. Priority Rating of Compatible Industries. Due to the limited number of input factors at Leupp (Labor, certain location advantages, a good site, utilities for dry industries plus selected monetary advantages), very definite values must be established for inputs in order that industries needing inputs which cannot be economically supplied at Leupp be effectively eliminated. After considering water consumption per dollar of value added, industrial skill levels, labor intensity, and several other factors (Chapter VI), the following industrial categories were found most compatible with the Leupp resource base:

Apparel production of many kinds.
Jewelry and artifacts production.
Electronics manufacturing and assembly.
Scientific and industrial instruments production.
Certain categories of heavy industrial machinery and tools production.

In all, 50 industrial categories are listed in Chapter VI according to a four-digit SIC breakdown.

7. Leupp Industrial Site Evaluation. The site designated for industrial development at Leupp contains 145 acres, is fairly flat, nearly rectangular in shape, has only minor drainage courses on it, supports only sparce vegetation and fauna typical of the S.W. High Plains. It is more than 400 feet from any residential or community structures, has sewer on site and is less than 400 feet from all other utilities.

The site does, however, require drilling and blasing for a portion of underground installations and it is over 20 miles from the nearest interstate highway, railroad and commercial air service.

The area of the site also contains two bladed air strips which may have to be relocated in the event of industrial developments.

Still, with a score of 100% for the ideal industrial park for the type of industries envisioned at Leupp, the park site, undeveloped as it now is, scored 67%. With developments the following scores are attainable:

As is:	67%
With improvements:	
Drainage, streets, relocated air strips: +7%	74%
Existing utilities brought to site: +6%	80%
Moderately expanded utility capacities +10%	90%
Basic utility, general aviation airport +4%	94%

The remaining 6% contain scores connected with the absence of rail service and the distance to an interstate highway.

### 8. Park Development, Phase I, Recommendations.

- Develop approximately 23 acres south of Navajo Route 15, east
  of the Chapter House Complex and north of the realigned landing
  strip (Figure II, Chapter VIII), as Phase I of the Leupp
  Industrial Park,
- Extend a 1,000 foot long, two lane, paved road south from Navajo Route 15 to end in a cul-de-sac near the relocated main landing strip.
- Construct a 12" diameter sanitary sewer line along the industrial park access road and connect this line to the existing sewer line along the north boundary of the site.
- Construct a ground storage tank for water with 500,000 gallons capacity and with fire pumps which can deliver 1,000 gallons per minute for four hours to satisfy fire flow requirements for a maximum of 1,000 employees in the park.
- Construct a 100,000 gallons elevated water tank to satisfy initial, daily demand both in the industrial park and in nearby residential areas, to be developed.
- Construct three wells and water collection system and distribution system with fire hydrants as required.
- Invite Arizona Public Service Company to extend the local 21 KV
   line to the site.

- Invite Southern Union Gas Company to extend a 4" gas line to the site from the BIA Boarding School.
- Invite Mountain Bell to extend to the site all communication services now required by large industrial firms.
- Stipulate that all utilities within the park boundaries shall be installed under ground.
- Tentatively plat the park development with lot sizes ranging from 1 acre to 10 acres in size and with a width to depth ratio of 1:2, but accommodate any tenant upon demand.
- Insure low building profiles, setbacks, buffer zones, landscaping, and shielding during implementation.
- Anticipate Phase I costs of \$813,318 plus engineering fees,
   applicable taxes and inflation after 1975.

## 9. Community Improvements Required.

- The Navajo Tribe should anticipate the need for housing and community support facilities in Leupp.
- Minimum housing requirements for Phase I of the industrial park will be 100 dwellings with streets, curbs, gutters, grading, water and sewer as appropriate.
- A 1975 cost of \$325,000 should be anticipated for new housing,
   plus engineering fees, applicable taxes and inflation after 1975.

### 10. Transportation Improvements.

 The bridge over Canyon Diablo Wash on Arizona Highway 99 must be rebuilt. Estimated cost: \$144,000.

### 11. Estimate of Economic Impacts.

- a. Provided development of the park and concomitant community support facilities commence in 1976 and proceed at a reasonable rate in subsequent years, and provided that recruitment of industrial tenants to Leupp is successful, then it may not be unrealistic to assume that the proposed industrial park may support 150 jobs in 1977, 300 jobs in 1978 and 1979, and perhaps reach 60% saturation by 1984 with 600 jobs. Higher and lower numbers are also possible, depending on the labor needs of specific tenants.
- b. Conservatively, over four years direct economic benefits could be as high as \$7,094,000. Total costs, including expenditures for Phase I developments, industrial buildings, pre-job and on-the-job training subsidies, should not exceed \$4,206,318. The benefit cost ratio is 1,69.
- c. Discounted at 10% per year, cumulatively, present value of benefits over four years becomes \$4,956,000 and present value of costs: \$3,232,577. The benefit cost ratio is 1.5.
- d. In all cases, whether computed over four or ten years the internal rates of return exceeded 20%. See Chapter IX.

e. Despite a nearly total lack of infrastructure and insignificantly small secondary multipliers, the primary economic effect of the proposed industrial park appears sufficient to render the project feasible.

### 12. Environmental Impacts.

a. Impacts which cannot be avoided. These are only temporary or of intermediate duration; construction, noise, dust, rerouting of traffic and some scarring of top soil.

### 13. Facilitating Measures.

- Extend the industrial site boundary to within 200 feet of the boundary of the Chapter House Complex. (This will allow for a more flexible first phase design and lower access and utility costs and will not conflict with land use in the Chapter House Complex which already is semi public and semi industrial.
- Rotate the main landing strip to a slightly more EW direction
  and eventually extend it westward to satisfy basic utility
  airport requirements for runway length. (This will solve the
  conflict with Navajo Route 15 and allow for a better shape of
  the industrial park which will not be cut off from Leupp by the
  landing strip.)
- 14. Specific Recommendations. In view of the estimated cost of initial park developments and the potential benefits to the Navajo, Tribe, it is specifically recommended that:

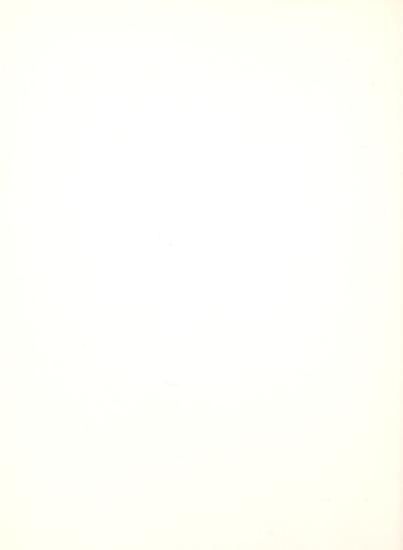
- The Navajo Tribe initiates and finalizes comprehensive community
  planning for Leupp as soon as possible.
- A community facilities funding and construction program be established to complement industrial park developments.
- A specific Leupp oriented promotion program be developed and carried out by the Navajo Tribe's Office of Program Development.
- Phase I of the proposed Industrial Park Plan be funded based on a 1975 cost of \$813,318 plus engineering fees and inflationary increases if applicable.
- Final design of the Leupp Industrial Park be commenced immediately upon funding.

It is the intent of Gordon Herkenhoff and Associates, Inc. to use 20 man-days during a six-month period following approval of the present report, to improve and measure the relative success of implementing the proposed Leupp Industrial Park.



# CHAPTER II

LEUPP, BACKGROUND AND PRESENT DEVELOPMENTS



## A. BACKGROUND:

The Navajo Nation encompasses approximately 25,000 square miles of land or slightly less than 16 million acres. The bulk of Navajo land lies in northeastern Arizona, north of a line running from Flagstaff east to the New Mexico state line. A very large portion of the reservation located in northwestern New Mexico, joins the Arizona portion at the Arizona-New Mexico state line. A smaller portion of the reservation, located in southeastern Utah, lies north of the Arizona-Utah state line, and south of Lake Powelland the San Juan River.

Within this huge land area, according to Bureau of Indian Affairs estimates, live 132,000 Navajos.

Over 85% of the Navajo people still live on land allocated to them by the Tribe as grazing areas for sheep and cattle. It is this traditional Navajo grazing economy, amazingly resilient in the face of enormous off-reservation economic changes, which continues to dictate reservation population dispersal - a population density of slightly more than five (5) persons per square mile, as compared to a 57.5 person per square mile density for the United States as a whole.

The dispersed population distribution pattern called for by the very nature of the traditional grazing economy, in turn, necessitate decentralization of government services. And, it is the decentralized government service center and its requirements which have largely determined the pattern of physical development of the Navajo Reservation.

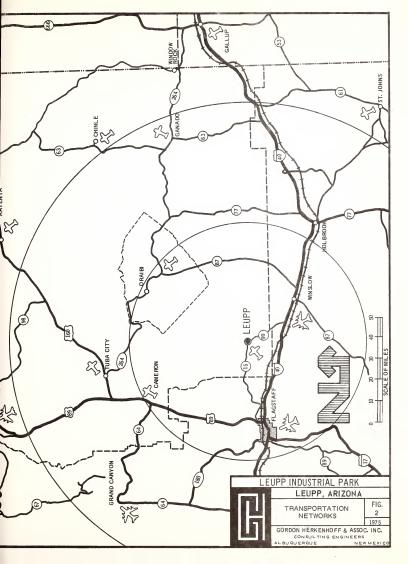
Around each center have grown up fairly elaborate complexes of both governmental and private services and facilities. Within the five agency headquarters, and the headquarters of the Bureau's Area office, for example, can be found industrial parks, commercial establishments health care facilities, tourism and recreational facilities.

The reservation road system has for many years been supportive of this pattern, serving primarily as the connecting linkage between the centers and the developments they have engendered.

Clearly, decentralization of government service centers to agency capitals is insufficient to adequately meet the needs of so scattered a populace. Hence, in recent years much of the Navajo Tribe's effort has been directed toward more balanced development of such smaller settlements as Leupp.

As is evidenced in Figure 2, increased road and airport construction on the reservation has already accomplished much toward this end. Ironically, and in spite of improved communications, the development program itself has resulted in geographically unbalanced economic growth of the Navajo Nation; along the Arizona-New Mexico border in the eastern portion of the reservation commercial and industrial expansion has been far more rapid than in the west where Leupp is located.

Whether this imbalance is again caused by locations of major administration centers is not certain at this time. It is clear, however,



that since most of the known Navajo energy resources are located in the northeastern portion of the reservation, development of these resources does not substantially lower unemployment rates in the west except if the labor force relocates.

Moreover, energy oriented industries in the eastern portion tend to be capital intensive, and yield more direct monetary income (royalties) to the Tribe than employment opportunities to tribal members. The thrust of the Navajo Industrial Development Program is, therefore, two pronged:

- 1. Through development of attractive and functional industrial parks it seeks to attract labor intensive industries to the reservation to lower the Navajo unemployment rate (50% overall) and
- 2. The development program emphasizes industrialization of the western settlements where the unemployment rate is highest (55%) and is designed to improve the geographic balance in the economic growth of the Navaio Nation.

The economic analysis and industrial park plan for Leupp as shown in this report should be considered with this background in mind.

### B. HISTORY:

Leupp is located along the southwest bank of the Little Colorado

River in north central Arizona and in the southwest portion of the

Navaio Nation.

For centuries the course the Little Colorado River has taken has been a route of travel for the Navajo and the relative availability of surface water led to scattered settlement in the area during the eighteen hundreds. In 1902, the Bureau of Indian Affairs established a boarding school on the northeast bank of the Little Colorado. The school's first supervisor was named Leupp. Due to minor flooding, the facilities were soon relocated farther east to a new site about a mile from the river. This is now known as "Old Leupp".

Leupp achieved greater significance in 1907 when the settlement became the headquarters of the "Leupp Reservation". This was one of the five Navajo reservations which existed prior to 1936 when the Navajo Nation was consolidated and administrative centers moved to Window Rock.

At the time of consolidation five "Agencies" were established and Leupp was put under the jurisdiction of the agency headquarters in Tuba City.

Although Leupp thus lost its function as an administrative center, the town continued to function as the hub of the "Leupp Chapter". The Navajo chapter organizations were established in 1923 as service units of the Agricultural Extention Service's efforts to import farm and homelife improvement techniques. These chapters have slowly been transformed into local governmental units, each with a council and a president.

Just prior to World War II, continuous rains caused the Little

Colorado to overflow and the flooding caused so much damage to the

BIA boarding school that it was abandoned. After the war, one of the

least damaged buildings was renovated and turned into a Presbyterian Church  $\operatorname{still}$  in use today.

Not until 1961 did the Bureau of Indian Affairs relocate the school at Leupp, and then on a ridge on the southwest bank of the river.

The modern school complex now is the center of activity of the new town of Leupp.

For many years the only private commercial enterprises in Leupp were the "Old Leupp" Trading Post on the east bank of the river at the old school site and the Sunrise Trading Post on the west bank. These are still operating. Both trading posts were probably established before 1910 and like similar enterprises elsewhere have served the important function of providing at least a minimum market for Navajo goods.

When the BIA school was moved to the westside of the river, much of the local purchasing power went with it. Sunrise Trading Post, therefore, is now the most active of the two.

#### C. CLIMATE:

The Mogollon Plateau, 30 miles southwest of Winslow and 50 miles south of Leupp substantially determines the climate of the Little Colorado Valley in which Leupp is situated. This barrier cuts off much of the flow of moist air from the south and west, with the result that the Valley area receives only slightly more precipitation than the arid southwest part of Arizona. Approximately 8.0 inches of rain falls annually, with one-half of this precipitation generally occurring during

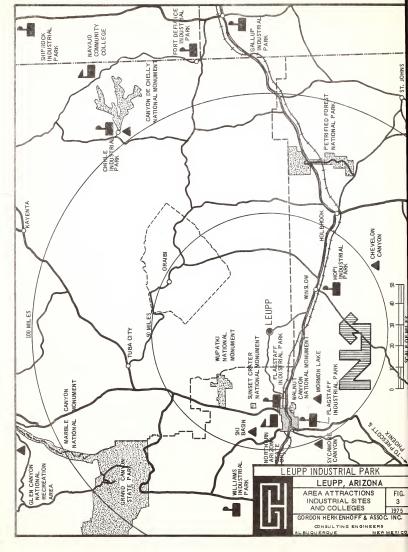
the months of July, August, and September. The area experiences a relatively mild climate with an average temperature of 32 degrees in January and 77 degrees in July. Prevailing winds are from the southwest.

#### D. AREA FEATURES:

Being located on the Navajo Reservation, Leupp can provide access to a varied land of mountains, upland and desert. Many of the most scenic attractions of the southwest lie within the Reservation's boundaries; Monument Valley, composed of a colorful array of mesas, spires and other geological formations; Canyon de Chelly, a magnificent formation containing much of the area's evidence of American prehistoric civilization; Grand Falls, formed by volcanic activity; and the Rainbow Bridge on the southern shore of Lake Powell.

To the south, along and below the Mogollon Rim, are numerous fishing lakes and streams. The Arizona Snow Bowl in the San Francisco Mountains to the west provides ample skiing, and hunting is good in surrounding mountain and forest areas.

Some of the more important tourist attractions in the region are shown in Figure 3.



#### E. POPULATION AND EMPLOYMENT:

In 1971, according to the BIA, the population in the Leupp Chapter totaled 1,426. Slightly over 90% of these are Navajo. While the majority of Leupp's Navajos herd cattle and sheep and produce a small amount of arts and crafts items (jewelry and rugs), the bulk of the non-Navajo population is employed at the BIA boarding school and the Arizona Public School's elementary school south of Navajo Route 15 (Figure 4).

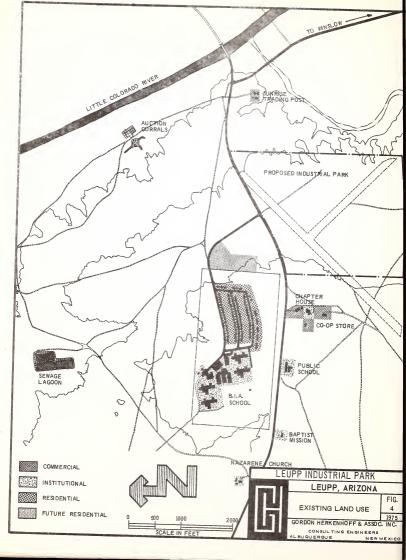
A few Navajos are employed at the El Paso Natural Gas Company compressor station 6 miles west of Leupp, others are employed at the AT & SF Railroad 30 miles to the south. Most Navajos who are not students receive transfer payments in the form of welfare and social security to supplement the subsistence income from the pastoral economy.

More recently, Hewlett Packard Company established a small electronic assembly operation in Leupp. This successful pilot activity employs eight Navajos and current plans call for expansion into the proposed industrial park with potential employment of 100-150 workers. Employment and population characteristics are analyzed in more depth in the economic section of Chapter IV.

#### F. ACTIVITIES:

Most of the town's leisure time activities center around the boarding school which opens all of its recreational facilities to the community.

Those facilities consist of a football and baseball field, outdoor basketball courts and indoor gymnasium. The school employs a professional



recreation director who organizes activities for both the school, its students, and the community at large. Movies are regularly shown in the gymnasium. An eleven acre rodeo ground situated two miles southwest of the boarding school offers considerable space for large outdoor activities. Picnics, day-hikes and church socials are also frequently sponsored by Leupp's three local churches.

## G. LEUPP HOUSEHOLDS AND ESTIMATED POPULATION:

A housing count in Leupp conducted in 1973 by staff members of the

Navajo Tribe's Office of Program Development gave the following results:

Indian Households	146
Non-Indian Households	_30
Total Households	176

Using average area figures of 3.5 persons per non-indian household and 5.6 persons per indian househols, the Leupp population becomes:

	Persons	Portions
Indian Population	818	89%
Non-Indian Population	105	11%
Total Population	923	100%

This housing count covered a two mile wide strip running three miles from Old Leupp to a point west of the Church of Nazarene, plus a one square mile area around the El Paso Natural Gas Company compressor station. Since most Navajo families follow the average pattern fairly closely, the estimate of population in the surveyed area should be reasonably accurate.

It must be kept in mind that many Navajos prefer to live in relative isolation and dwellings can be found in unexpected locations across the land. A larger land area than the one surveyed for Leupp proper would, therefore, yield a higher person count. Population density parameters in the context of traditional community planning are not directly applicable and it can only be stated that while around 1426 persons occupy the 4000 square miles of the Leupp Chapter, approximately 923 of these persons lives on seven square miles in the vicinity of Leupp.

#### H. LAND USE.

The term "land use" must be flexibly applied when analyzing the developments at Leupp. Except for the BLA boarding school with its educational and residential compounds there is nothing that can be regarded as complete or even partially saturated land use.

The Chapter House complex south of the BIA school consists of 10 acres on which a community cooperative food store, a warehouse for the Tribe's Donated Food Program, and the Chapter House itself are situated. The land is owned by the Leupp Chapter of the Navajo Tribe. Recently the Chapter appropriated an acre of its land for a wool-receiving warehouse which is now complete. In addition the Hewlett Packard Company occupies a mobile home located alongside the food program warehouse. These facilities occupy a minor portion of the ten acres in this parcel. The Arizona Public Schools Elementary School facilities occupy around

four acres and are situated on the southside of Navajo Route 15 more than 1,000 feet west of the Chapter House Complex,

The Baptist Mission, also on the southside of Route 15, is located another 1,250 feet west of the elementary school. The Nazarene Church, north of the road, is 1,100 feet west of the Baptist Mission. See Figure 4. Sunrise and Old Leupp Trading Posts are located two miles and one mile east of the Chapter House Complex respectively.

Table 1 shows the occupied acreages in the 7 square mile planning area by type of use. Included in the residential category is the planned construction of a low-cost mutual help housing development which will begin during 1975. Plans for the development have already been finalized and include provisions for ten 3-bedroom, twelve 4-bedroom and three 5-bedroom houses. This housing development will constitute the only other "complete" land use development in the area.

In view of the above, there exists considerable flexibility with regard to land use compatibility between the proposed industrial park and surrounding developments.

### I. SCHOOLS AND EDUCATION.

The following data was gathered by the Tribal Office of Program Development for the 1972-73 School year:

Leupp Elementary School (Kindergarten - 6th Grade):

- 201 Students
  - 7 Teachers
  - 1 Librarian (Part-time)
  - 10 Other Personnel
  - 6 Classrooms
- 28.7 to 1 Student-Teacher Ratio

## TABLE J

# GENERAL LAND USE

Total Gross Planning Area Type of Use	Gross Area	4,480 Acres %Total Gross Area
Commercial:	35 Acres	.78%
Sunrise Trading Post Leupp Trading Post (Old Leupp) Co-Op Store Donated Food Program Facility Auction Corral Wool Warehouse		
<u>Institutional Schools</u> :	82 Acres	1.82%
Leupp Boarding School (BIA) Leupp Elementary School (Public) Leupp Pre-School (ONEO)	(70)	(1.56%)
Churches:		
Leupp Baptist Mission Leupp Presbyterian Church) Leupp Church of Nazarene	(10)	( .22%)
Tribe and U. S. Government:	(2)	(.04%)
Plant Management (BIA) Boarding School Clinic (PHS) Chapter House (Tribe) Sewage Lagoons (BIA 7 PHS)		
Industrial:	204 Acres	5.89%
El Paso Natural Gas Sunrise Airstrip Wool Processing Plant (Proposed) Hewlett Packard Industrial Park (Proposed)		
Parks and Recreational:	11 Acres	.24%
Rodeo Ground		
Residential:	135 Acres	3.01%
Existing Houses Proposed Houses		
Total Area Developed (Not including Roads)	520 Acres	11.74%
Residential Density:		ross Acre of Residential 9 acres of total land

Special Services: Reading program, library program, art and music classes, counseling, health education and drug abuse prevention programs, speech and hearing services.

The Leupp Public School will have an increase of students from two-hundred to five-hundred (200-500) during the fall term of the 1975-1976 school year. Due to this large increase of students, as well as school administrators, there will be an additional demand for water and housing. Some of the housing demand may be satisfied by the mutual help housing development mentioned above but with respect to water consumption it is conceiveable that a new well must be drilled to relieve the demand on the BIA water system which now supplies the public school.

Leupp BIA School (Kindergarten - 8th Grade):

- 481 Students, Boarding
  - 33 Day Students
  - 22 Teachers
- 2 Special Education Teachers
- 111 Other Personnel
- 24 Classrooms
- 21.5 1 Student-Teacher Ratio

#### Special Services:

- Special Educational Program: At present, there are 25 students and 2 special education teachers working in a program designed to allow slow students to learn from teachers trained to meet their individual needs.
- Teacher Training Program: Teacher training is provided by Northern Arizona University at Flagstaff through a program which permits teacher

aids to continue their education and take college courses at the boarding school.

- 3. Foster Grandparent Program: This program, sponsored by ONEO, is operated by three elderly men and three elderly women who come to the boarding school campus and share daily school life with the students.
- 4. Pre-School: 25 students attend this pre-school which is located at the Chapter House. The Pre-School is run by one teacher and two teacher aids.
- Food Program: Because of lack of facilities, the boarding school provides lunch for both pre-school and elementary school students.

Because neither a Junior High nor a High School exists in Leupp, Leupp students are bussed to Flagstaff. This is unfortunate since it is an hour drive each way, and unless special transportation is arranged, Leupp students cannot involve themselves in the extra curricular activities of the Flagstaff schools. There has been some talk by the Flagstaff School Board about extending Junior High and High School facilities to Leupp, but nothing has yet been done by way of implementation.

## J. FIRE PROTECTION:

Operating out of the Plant Management Office on the Boarding School campus, fire protection is provided by a voluntary fire department. The department has one pump fire truck, and can call on eleven (11) fire-fighters when needed. Service is provided for the boarding school and those buildings and houses located within a 5 mile radius of the campus.

No industrial fire protection exists beyond the existing service.

#### K. POLICE PROTECTION:

At this time, Leupp has little police protection. A Navajo Police

Department substation is located at Cameron, Arizona. A Navajo

Police Department district office is located at Tuba City, Arizona.

#### L. MEDICAL AND HEALTH CARE:

Medical facilities in Leupp are minimal with one Public Health nurse providing daily general care at the boarding school health clinic.

Once a week a doctor and a Community Health Representative, who is responsible for home visitation in the Leupp area, come from Winslow and offer general medical care to the community. A Maternity Child Health nurse from Winslow also comes once a week to provide pre-natal and well-baby care. Tuberculosis Control and Health Educational Programs are operated through the clinic. Daily dental care is furnished by a dentist from Winslow.

Because of only minimal ambulance services now offered, it is sometimes necessary to send patients to Winslow for emergency care, and unless the Maternity Child Health nurse or Community Health Representative is present there is no sure means of transportation.

Because of the situation at Leupp most local residents use the outpatient services of the Winslow Public Health Hospital. The outpatient services provided include a general clinic and specialty clinics for cardiology, opthalmology, and tuberculosis control. Other outpatient services include pre-natal and post-natal care and well-baby clinics. Inpatient care includes pediatrics and general medicine.

In case of illness or injury beyond the scope of Winslow Hospital staff, patients are send to either Flagstaff, Gallup or Phoenix.

As part of a program to improve health care throughout the Reservation the Navajo Health Authority is currently working on plans for a Tribal Medical School and has chosen Leupp as one of a number of possible locations for it.

#### M. LOCAL TRANSPORTATION FACILITIES:

Except for the two highways (Arizona 99 and Navajo Route 15), and the streets in the housing development next to the boarding school, all the roads in the Leupp area are unpaved. BIA Plant Management employs a grader operator from Tuba City who is responsible for their upkeep. Although there has been discussion of paving of more roads, especially of roads from Sunrise to Oraibi and from Leupp to Cameron, no firm plans have yet been developed.

Located just twenty miles south of Leupp and with direct access to Highway 99, Interstate 40/Route 66 is of major importance to the Leupp area. Running from California to Illinois, it assures major highway connection to all parts of the United States.

Road conditions along Navajo Route 15 westward to Flagstaff are excellent: the two-lane paved road is well maintained and cattle guards are in grade.

Arizona 99 toward Winslow, however, does not meet the requirements of a potential industrial area. Some cattle guards are in need of

reconstruction, portions of the road need a completely new surfacing and the bridge over the Canyon Diablo Wash just to the west of the Little Colorado River near the Sunrise Trading Post needs to be completely replaced with a two-lane structure. At present access from Winslow is via a bladed dirt road across the bottom of the wash. The bridge is not used except during floods and then only by relatively light vehicles.

### N. ROAD TRANSPORTATION SERVICES:

Two truck lines, Hopper Freight Lines and Thunderbird Express, provide freight service to and from Leupp for 20 major interstate carriers who have combined service throughout the United States and serve terminal points in Winslow, Flagstaff and Phoenix. Additional freight capability is provided by United Parcel Service, Continental Trailways and Greyhound Bus Lines, and on its Tuba City run the ONC Freight Line also services Leupp.

### O. RAILROADS:

The Atchison, Topeka and the Santa Fe Railroad parallels Interstate 40 between Flagstaff and Winslow and both AT &SF and Amtrack have daily east-west trains out of these towns with connections to all major U. S. cities. Santa Fe Railroad freight service travel time is a day and a half to Los Angeles and three days to Chicago.

To bring a spur railraod to Leupp would require around 20 miles of new track at an approximate cost of \$25.00 per linear foot excluding cost of grading and land acquisition. Negotiations with Santa Fe for the

financing of the spur can only begin after it is known what types of industries will make use of it and when the average annual number of carloads can be estimated.

#### P. LOCAL ATRPORT FACILITIES

During construction of the El Paso Natural Gas Company compressor station west of Leupp and the gas pipeline past the town, EPNG bladed out a small airport now occupying most of the designated area for the proposed industrial site just east of the Chapter House complex.

The main runway is 4,000 feet in length and the crosswind runway is 2,400 feet long. (Figure 4) Both runway surfaces have some sandstone outcroppings in certain areas and a very thin layer of broken shale over the base rock in most other areas.

A small concrete parking apron and a wind direction indicator are the only terminal facilities. The apron with room for one plane is on the south side of the major runway and is, therefore, cut off from the town of Leupp by the main runway. At present this matters little since traffic on the runway is minimal.

As it now exists the Leupp airport does not satisfy the requirements of the recently completed Navajo Airport Systems Plan. This plan calls for a basic utility airport at Leupp with possibilities for future expansion to eventually handle executive jets.

At an elevation of 4,750 feet above MSL and a design temperature of  $80\,^{\circ}\text{F.}$ , the Leupp Basic Utility Airport should have the following dimensions:

	Length	Width
Main Runway, Stage I	4,400 Ft.	50 ft.
Main Runway, Stage II	5,600 Ft.	60 ft.
Crosswind Strip	3,200 Ft.	50 ft.

No specific airport site at Leupp is indicated in the Navajo Airport System Plan and a preliminary study of topography in the area shows that the site of the present airport is most likely the best one for the purpose.

A slight realignment of the existing runways will allow for the dimensions shown above and is highly compatible with an industrial air park concept. These possible solutions are discussed in detail in chapter VIII, "Industrial Park Master Plan,"

### Q. AIR TRANSPORTATION SERVICES:

In addition to the unpaved runways at Leupp, additional air freight and air travel facilities are available at Flagstaff and Winslow, Arizona both located within 50 miles of Leupp. These air terminals are served by Frontier Airlines using Convair 600 aircraft. Major interchange points with transcontinental and western carriers are at Albuquerque, Denver, and Phoenix.

#### R. WATER:

Water Supply: Due to the proximity of the Little Colorado
River, groundwater supply is plentiful and the many stockwatering
wells in the Leupp area are fairly shallow and yield water of
high quality.

In Leupp proper there are four major producing wells:

- o BIA School Wells No. 1 and 2.
- o The "Chapter House Well" and, the
- o "5-T Well" just west of Highway 99 immediately south of Canyon Diablo Wash.

Data on the last two wells is not available, but the geologic characteristics in the area are fairly uniform and the information obtained about the two BIA wells on the Boarding School property is representative.

Data for BIA Well No. 1:

This well is located 150 feet west and 150 feet south of the northeast BIA School property corner. See Figure 4.

### WELL NO. 1 - DRILLING LOG:

Start Depth Feet	Stop Depth Feet	Depth to Water	Sample Cl	lassificati		Sample No.
0	30		Red Shal	le - Moenco	pi	11
30'	170		Yellow I	Limestone -	Kiabab	22
170	210	175	White Sa	andstone -	Coconin	a 3
210	270		11	11	11	3
270	370		11	***	11	3
370	405		11	"	11	3

A ten hour pumping test established a yield of 60 GPM at a water depth of 135 feet and insignificant drawdown.

# Data for BIA Well No. 2:

Depth Drill	 400	feet
Casing (10") Installed	 395	feet
Perforations in Casing	 100	feet
Depth of Sand	 170	feet
Depth to Water	 152	feet
Static Water Level	 125	feet

A ten hour well test on April 6, 1959 verified a yield of 75 GPM and a drawdown of 0.8 feet.

# 2. Water Quality:

Z. Miles Quality.	
WATER ANALYSIS - MINE	RAL
Sample: Leupp, Arizona, BIA Well No. 1	
From: Department of Interior Date	Received: July 11, 1960
Bureau of Indian Affairs	
Appearance: Clear	
Odor: Cold O.K. Hot O.K. pH 9.2	
Residue: (Parts per Million) Alka	linity: (Parts per Million)
	tal Alkalinity as
	CO3 Equilavent 212
	rmal Carbonate 25
Suspended Residue 8 Hye	droxide 0
	carbonate 206

# On Filtered Sample

Silica (SiO <sub>2</sub> )	15	Hardness:	
Alumina and Iron Oxides (R <sub>2</sub> O <sub>3</sub> )	9	Total Hardness: 419	
Lime (CaO) Magnesia (MgO)	173 72		
Sulfur Trioxide			
(SO <sub>3</sub> )	203	Remarks - Manganese - Nil	
Chloride (C1)	261	Flourides - Nil	
Alkalies as Na <sub>2</sub> 0			
(Calculated)	141		

# WATER ANALYSIS - MINERAL

Sample: Leupp, Arizona	a, BIA Well N	No. 2	
From: Department of In	nterior	Date Received:	April 10, 1959
Bureau of Indian	n Affairs		
Appearance: Clear			
Odor: Cold O.K.	Hot O.K.	pH 7.7	
Residue: (Parts per Mi	illion)	Alkalinity: (Pa	arts per Million
m . 1 o 111	0 / 1	m 1 A 11 7 *	4.4

Residue: (Parts per Million) Alkalinity: (Parts per Milli	
Total Solids 941 Total Alkalinity as	
Fixed Residue 682 CaCO <sub>3</sub> Equivalent 18	82
Suspended Residue 4 Normal Carbonate	14
Hydroxide	0
Bicarbonate 19	93

# On Filtered Sample

Silicia (SiO <sub>2</sub> ) Alumina and Iron	2	Hardness:	
Oxides (R <sub>2</sub> O <sub>3</sub> )	Ni1	Total Hardness 224	4
Lime (CaO)	134		
Mangesia (MgO)	Ni 1		
Sulfur Trioxide			
(SO <sub>3</sub> )	192	Remarks - Manganese, Mn - Nil	
Chloride (C1)	210	Flourides, F - Nil	
Alkalies as Na <sub>2</sub> O			
(Calculated)	278		

All results in parts per million.

3. Water Consumption & Distribution: Water is now produced from three wells, two on the BIA Boarding School compound and one by the Chapter House. On the BIA compound there is also a 150,000 gallon elevated storage tank from which water service is provided for the boarding school, the public school across the road and the Chapter House farther east.

The Chapter House well is now connected to the system, but since no well test has been performed on this well and, due to the lack of meters on the well pumps, no accurate flow figures are available at present.

On the average, however, approximately 50,000 gallons are pumped each day for community consumption. Plant management sometimes has to run both pumps 8 hours a day to keep up with the demands for water. Demand is not as intense during the summer when the schools are not in session.

Currently, the water supply appears to be adequate for local needs, but, in view of the expansion of the Elementary School, plans are now under way to install a 4" line to replace the 2" line from the BIA Boarding School storage tank.

At the present time the 2" line at the Chapter House is the closest water supply to the proposed industrial park. However, the Navajo Tribal Utility Authority (NTUA) plans to bring a major water line to Leupp from Bird Springs 12 miles to the east and spokesmen for the Winslow field office of the Public Health Service envision an eventual connection with the "5-T Well" south of the Sunrise Trading Post.

In conclusion, groundwater is plentiful for dry industries but at present the developed water supply appears insufficient for an industrial park. Cost for an adequate water supply is shown in Chapter VIII.

# S. SANITARY SEWER FACILITIES:

In similarity to the water supply, sewage collection, transportation and treatment at Leupp has traditionally been supplied primarily for the BIA Boarding School.

The old system consisted of a 10" line extending north from the Boarding School to four lagoons (310' by 125'each) totalling approximately four acres. These facilities have long been overloaded, however, and during the winter of 1974-1975 the Public Health Service and the NTUA designed and constructed new sewage lagoons.

A new 8" interceptor now runs from the Elementary School east to the proposed industrial park site, curves north under Navajo Route 15 and the EPNG pipeline from where a 12" line continues to the new lagoons. These lagoons are anticipated to operate at 60% capacity with the old BIA lagoons at standby. Dry industries at the proposed industrial park should, therefore, find present sanitary sewer services adequate for some time to come. Design data of the new sewer line are listed on the following page.

SELECTED DATA PERTAINING TO THE RECENTLY CONSTRUCTED PHS SANITARY SEWER LINE\* AT LEUPP

MANHOLE	ELEVAT	ION FEET	DISTANCE	FROM	TO	GRADE
	OUT	IN	FEET	MANHOLE	MANHOLE	
No. 14	4715.0	4715.0				i
No. 15	4716.0	4722.0	300	No.14	No.15	0.33%
No. 16	4726.0	4726.0	480	No.15	No.16	0.83%
No. 17	4730.0	4731.0	480	No.16	No.17	0.83%
No. 18	4736.0	4736.0	470	No.17	No.18	1.06%
No. 19	4741.5	4741.5	470	No.18	No.19	1.17%
No. 20	4748.0	4748.0	3 6 5	No.19	No.20	1.78%
No. 21	4752.0	4752.0	415	No.20	No.21	0.96%
No. 22	4755.5	4755.5	553	No.21	No.22	0.63%
					1	

Source: Public Health Service, Field Engineering Office, Winslow, Arizona, March, 1975.

#### T. NATURAL GAS:

The Southern Union Gas Company purchases it's supply from E1 Paso
Natural Gas for local consumption and services a total of 52 meters
at Leupp. Most of these are within the BIA Boarding School compound.
Only the Elementary School and the Baptist Mission receive gas outside the Boarding School.

Gas distribution is through a 4" main from the El Paso Natural Gas line to a major metering and valve station located in the south-central portion of the BIA Boarding School complex. All other buildings in the town use propane and/or electricity for heating and cooking purposes.

<sup>\*</sup> This is a 12" line from the new lagoons to manhole No. 14 and an 8" line from manhole No. 14 to manhole No. 22.

#### U. ELECTRIC POWER:

Arizona Public Service Company (APS) supplies electricity to Leupp from a substation at Leupp Corner near I-40 twenty miles south of Leupp.

This substation has a 1,000 KW capacity, takes its power from a two-way feed, 69 KV line between Flagstaff and the Cholla Power Plant at

Joseph City east of Winslow and delivers a three phase 21 KV to Leupp.

No shortage of power is expected in any of these systems barring major catastrophe, and Arizona Public Service Company can adequately supply the Leupp area with power until at least 1980 if demand increases at an expected rate. If demand increases dramatically the APS can increase the substation capacity with no difficulty.

NTUA is now negotiating with APS and may acquire the electrical system in the near future. When this takes place, the Tribal Water Works

Department will also extend its control to Leupp's water and sewer facilities.

### V. SOLID WASTE DISPOSAL:

Three acres by the east boundary of the proposed industrial park on the escarpment to Canyon Diablo Wash is now used for a sanitary landfill. This landfill serves the entire community with most of the solid waste generated by the BIA Boarding School.

#### W. NET MONTHLY UTILITY RATES:

 Electric: The monthly billing is the sum of the demand and energy charges set forth on the following page:

## Demand Charge:

First	25 kw	 None
Next	175 kw	 \$1.75
Over	200 kw	 1.25

## Energy Charge:

First	50	kwh or less	3.50
Next	150	kwh	.045 per kwh
Next	800	kwh	.032 kwh
Next	6,000	kwh	.027 kwh
Next	200	kwh per kw over 25 kw,	
		but not less than	
		5,000 kwh	.02 per kwh
Additional	kwh		.01 kwh

# 2. Natural Gas:

First	3	Mcf\$1.6820	per	Mc f
Next	12	Mcf	per	Mcf
Next	35	Mcf	per	Mcf
Next	100	Mcf	per	Mcf
Over	150	Mcf	per	Mcf
Minimum	Charge:	24 95		

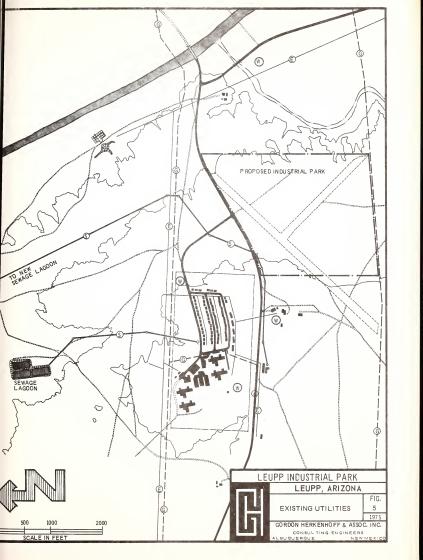
## 3. Water:

First	20,000	gallons	\$ . 75	per	1,000 gal	١.
Next	55,000	gallons	. 65	per	1,000 gal	l.
Next	75,000	gallons	. 60	per	1,000 gal	L.
Over		gallons	.55	per	1,000 gal	L.

## 4. Sewer:

40% of the net monthly water service charge for the current month.







# CHAPTER III

NAVAJO POPULATION & SOCIAL CHARACTERISTICS



#### A. INTRODUCTION.

Although an exact figure has not been established it can be said with some measure of confidence that there are between 130,000 and 140,000 Navajo Indians living on their Reservation of 25,000 square miles. As such, they comprise the largest homogeneous Indian group in the United States: they are one-third of all Reservation Indians living on one-fifth of all Reservations lands.

The Navajo Population is thought to be increasing faster than the U. S. population at present, but in keeping with the uncertainty regarding the current population size, the exact rate of growth has not yet been ascertained.

It can be said, conservatively, that demographic, social and economic statistics for the Navajo Reservation and for Navajos living off the reservation, are inadequate for most planning purposes. The degree of conflict and inadequacy in the statistical base is discussed further in Appendix 1, which contains quotations from a proposal for the establishment of a "Navajo Research and Statistics Center" as envisioned by personnel in the Tribal Office of Program Development.

It is essential, however, for a proper understanding of subsequent data analysis that the reader fully comprehends the depth of confusion which characterizes the data base. The following example may suffice:

	BLA	U.S. CENSUS
NAVAJO POPULATION ON RESERVATION, 1970	126,265	64,675
NAVAJO PER CAPITA INCOME, 1970	\$831	\$740

The U. S. Census does not consider Eastern Navajo Agency (one of five administrative sectors of the Reservations) as on-Reservation. This demonstrates different statistical universes. However, total Navajo population, including off-reservation persons, determined by the Census, is 96,734. This demonstrates either significant under-enumeration on the part of the Bureau of Census or a severe over-estimation by the EIA, or both.

For reasons such as this the analysis which follows attempts to focus on characteristics, percentages, distributions and structure rather than on absolute magnitudes. Only when estimating potential labor force at Leupp will magnitudes be shown, and the discussion reflects at all times the most conservative figures available, which in most instances are those provided by the U. S. Census.

# B. POPULATION.

Reading from Table 2 only 61.9% of all Navajos lived inside the borders of the contiguous Reservation in 1970 and by far the largest portion of these, 41.2%, lived in Arizona. Traditionally Navajo women have outnumbered the men and in 1970 women constituted 51.35% of the total population, the men 49.65%.

TABLE 2

NAVAJO POPULATION BY SEX & LOCATION OF RESIDENCE, 1970

	MALE	FEMALE	TOTAL	Percent
Total Persons Off Reservation On Reservation Arizona New Mexico Utah	47,065 18,335 28,730 19,4262 8,240 1,064	49,678 18,558 31,120 20,4742 9,460 1,186	96,743 36,893 59,850 39,900 17,700 2,250	100.0 38.1 61.9 41.2 18.3

Source: Navajo Census, 1970.

1/ Includes 2,901 Navajos in the Navajo-Hopi joint use area.

2/ Estimated.

Most Navajos still practice their age-old lifestyle and no settlement on the contiguous Reservation can be called "urban". As shown in Table , 84% of the on-Reservation Navajos were living in a rural non-farm enviornment, 15.5% lived in a rural farming environment in 1970. Only off-Reservation Navajos lived in an urban setting.

TABLE 3

URBAN AND RURAL RESIDENCE OF NAVAJOS, 1970

Total Population	96,743	56,949
Urban Rural nonfarm Rural farm	16,276 70,223 10,224	48,127 8,822
Source: Navajo Census, 1970.	All Navajos	On-Roservation

<sup>\*</sup> Does not include 2,901 Navajos in the joint use area.

#### C. AGE.

In 1970, Navajos were 24.2 years old, on the average, but the median age was 18.4 years which indicates a rapid expansion of the younger age groups (See Table 43 in Appendix 4). This conclusion is supported by statistics in Table 44, Appendix 4, which states that 51,401 Navajos or 53.1%, were 18 years of age or younger. The significance of this as regards the future labor force is immediately apparent.

# D. HOUSING REQUIREMENTS.

A study of Navajo housing statistics is reminiscent of similar data covering a rural, midwest area around the turn of the century. Of the 10,531 on-Reservation housing units, 2,547 or 24.2% were occupied by one or less persons per room. 1,172 housing units, or 11.1% had between 1 and 1.5 persons per room. But the significant statistic (Table 4) is that 6,812 or 64.7% of the dwellings had "more than" 1.5 persons per room.

The contents of Table 5 shows what was unexplained in Table 4; the median number of rooms per on-Reservation dwelling was 2.0, and 4,239 dwellings had only one room. That amounts to 40.3% This, coupled with the fact that 45.8% of on-Reservation households had six persons or more begins to indicate the differences between the Navajo family life and averages for the United States as a whole.

It is of interest that 94.5% of all housing units were single units structures and in addition to mobile homes and trailers (mentioned in Table 4), a sizeable portion of these single units were hogans.

TABLE 4
OCCUPANCY AND CHARACTERISTICS OF NAVAJO DWELLINGS, 1970

PERSONS PER ROOM	TRIBE	ON RESERVATION
1.00 or less	5,389	2,547
1.01 to 1.50	2,261	1,172
1.51 or more	11,081	6,812
Units with all plumbing facilities -	,	-,
1.01 or more	3,481	1,713
UNITS IN STRUCTURE		
1 (includes mobile home or trailer)	16,324	9,951
2	558	160
3 and 4	381	112
5 to 49	1,363	308
50 or more	104	-
YEAR STRUCTURE BUILT		
1969 to March, 1970	1,215	799
1965 to 1968	3,435	2,351
1960 to 1964	3,642	2,324
1950 to 1959	4,609	2,559
1940 to 1949	1,939	853
1939 or earlier	3,891	1,645

Source: Navajo Census, 1970.

Dwelling units on the Reservation are fairly young and data in Table 4 indicates that 76.3% of them were built after 1950. The uniform age distribution by five year intervals further shows that a fairly stable housing construction program has been carried out the last 25 years.

The figure for 1969-1970 indicates that the program was accellerated at that time and the Navajo Tribal Housing Authority (NTHA) has maintained the higher pace since. NTHA has the planning, design, financial and construction capabilities to provide Leupp with high standard housing on relatively short notice.

TABLE 5
HOUSING CHARACTERISTICS OF NAVAJO HOUSEHOLDS: 1970

	TRIBE	ON RESERVATION
Total Households	18,731	10,531
In owner occupied units	9,998	6,474
Percent	53.4	61.5
In renter occupied units	8,733	4,057
ROOMS		
l room	6,917	4,239
2 rooms	3,698	2,107
3 rooms	3,081	1,545
4 rooms	2,516	1,269
5 rooms	1,881	1,141
6 rooms	407	166
7 rooms or more	231	64
Median	2.2	2.0
PERSONS		
l person	1,749	925
2 persons	2,512	1,265
persons	2,217	1,136
+ persons	2,285	1,218
persons	2,120	1,170
6 persons or more	7,848	4,817
Median, all occupied units	4.8	5.1
Median, owner occupied units	5.1	5.3
Median, renter occupied units	4.5	4.9
Units with roomers, boarders,		
or lodgers	337	108
	April and a second a second and	
Source: Navajo Census, 197	0.	

## E. EDUCATION.

Current school enrollment is high among the Navajo primarily because of the large number of Navajos below the age of 18, but college enrollment is also encouraging with 1,391 students.

It can be anticipated that nearly all of the 23,995 elementary school students in 1970 will go on to high school with the result that each year during the 1970's the labor force will potentially be augmented by 3,000 young Navajos with some secondary education.

At the time of this writing all those in high school in 1970 (8,649 students) are now either in the labor force or in college. All those who were in college in 1970 (1,391 students) are now in the labor force, but probably not on the Reservation.

The education program on the reservation has only recently gathered force, however, and for the entire existing labor force which includes all age groups, the educational background is rather bleak. Table 6 shows the years of educational experience for the age groups between 23 and 35 years of age which comprise the central component of the Navajo labor force. This group has the least number of students and are experiencing the highest rate of unemployment.

TABLE 6
SCHOOL ENROLLMENT (23-34 YEARS OLD) ON THE NAVAJO RESERVATION

Total enrolled, 3 to 34 years old	37,266
Nursery School	593
Kindergarten	2,638
Elementary (Grades 1-8)	23,995
High School (Grades 9-12)	8,649
College	1,391
	,

Source: Navajo Census, 1970.

TABLE 7
YEARS COMPLETED IN ANY SCHOOL BY NAVAJOS 23-35 Years Old

		TRIBE	ON RESERVATION
Ma	ile, 25 to 34 years old	5,734	2,940
Elementary:	Less than 5 years old	1,209	631
	5 to 7 years	911	425
	8 years	5 64	299
High School:	1 to 3 years	978	542
-	4 years	1,466	764
College:	1 to 3 years	501	230
	4 years or more	105	49
Fe	male, 25 to 34 years old	6,230	3,359
Elementary:	Less than 5 years	1,705	971
-	5 to 7 years	1,035	517
	8 years	571	324
High School:	1 to 3 years	1,072	581
	4 years	1,380	751
College:	1 to 3 years	406	173
	4 years of more	61	42

Source: Navajo Census, 1970.

On the Reservation there were 6,299 Navajos of both sexes between the ages of 23 and 35 with some educational experience. Only 91 or 1.4% had graduated from college, only 403 more had ever gone to college, only 1,515 had graduated from high school, only 1,123 more persons in this age group had ever gone to high school and the bulk, 3,167 Or 50.3% had an 8th grade education or less.

The Bureau of Indian Affairs operate the majority of schools on the Reservation and, was responsible for 22,094 students of all levels in 1972. (See Table 45 in Appendix 4). BIA also sponsors some higher eudcation programs and enrollment was 1,732 undergraduates in 1972.

It is unfortunate that only 100 of these were in degree programs.

TABLE 8

## BUREAU OF INDIAN AFFAIRS HIGHER EDUCATION PROGRAM: FY 1972\*

AREA OF AGENCY	TOTAL NO. STUDENTS	NO. UNDER- GRA. STU.	NO. GRA. STUDENTS	UNDER GRA. STU. EARN- ING DEG.	GRA. STU. EARNING DEGREES
Navajo	1,732	1,732		100	

\* This table indicates thenumber of undergraduate and graduate students who received scholarship grants during fiscal year 1972, also the number of students earning degrees.

Source: BIA Statistics On Schools, Annual Report, Fiscal Year 1972.

## F. INCOME.

Low education levels combin  $\epsilon$  with a number of other factors to make the Navajos one of the poorest population groups in the country.

Most income distributions follow the normal distribution in a general way, but on the Navajo Reservation individuals and families are distributed in income brackets more along a rectangular hyperbola with a continuously diminishing percentage in successively higher income brackets.

Of 9,733 on-Reservation families 4,800 or 49.3% earned less than \$3,000 in 1970, and median income was, consequently, \$3,084.

On the Reservation 64.5% of all individuals had an income lower than the established poverty level and 62.1% of all Navajo families were poverty stricken by the same definition. See Tables 9 and 10.

TABLE 9
FAMILY INCOME OF NAVAJO POPULATION: 1970

INCOMES OF FAMILIES	TRIBE	ON RESERVATION
All Families	16,779	9,733
Less than \$1,000	3,761	2,412
\$1,000 to \$1,999	2,151	1,325
\$2,000 to \$2,999	1,882	1,063
\$3,000 to \$3,999	1,372	793
\$4,000 to \$4,999	1,298	753
\$5,000 to \$5,999	1,099	624
\$6,000 to \$6,999	1,114	668
\$7,000 to \$7,999	838	466
\$8,000 to \$8,999	682	344
\$9,000 to \$9,999	659	315
\$10,000 to \$11,999	789	381
\$12,000 to \$14,999	717	383
\$15,000 to \$24,999	358	178
\$25,000 and over	59	28
Median Income	\$3,434	\$3,084
Mean Income	\$4,608	\$4,285
All unrelated individuals 14		
years old and over	5,425	1,493
Mean Income	\$1,505	\$1,319
Per Capita Income of Persons	\$ 886	\$ 776

Source: Navajo Census, 1970

TABLE 10

POVERTY STATUS OF NAVAJO POPULATION, 1970

INCOME LESS THAN POVERTY LEVEL		
	All Navajos	On Reservation
Persons	56,426	36,538
Percent of all persons	60.2	64.5
Percent 65 years old and over	5.0	5.5
Families	9,765	6,040
Percent of all families	58.2	62.1
Mean Size of Family	5.77	5.90
Mean Income Deficit	\$2,751	\$2,844
With Related Children Under 18	8,304	5,090
Families with Female Head	2,364	1,395
Unrelated Individuals 14 years		
old and over	3,255	1,042
Percent of all unrelated		
individuals 14 years and		
over	72.1	77.1
Percent 65 years old and over	17.9	35.2
Mean Income Deficit	1,389	1,312

Source: Navajo Census, 1970

The reasons for the low income is not lack of formal education, not lethargy or under-achievement in schools or on jobs. The reason is simply lack of jobs and job opportunities.



## CHAPTER IV

NAVAJO INDUSTRIAL PROFILES & LABOR FORCE CHARACTERISTICS



## A. EMPLOYMENT BY INDUSTRY

Of the 35,000 Navajo men and women who now need work and want work, only a few more than 17,000 are regularly employed. Two thirds of those regularly employed work for one or another of the Reservations employers. One third are self-employed. The great majority of self-employed Navajos are engaged in stock raising, handicraft production, and other traditional pursuits; only a few are business proprietors. 1

The other 18,000 members of the Navajo labor force are "nonemployed"
-- i.e., are not in school, and, answering a manpower interview,
stated that they (1) did not have a job, (2) wanted a job, and (3)
were not physically or mentally or otherwise constrained from working.

An urban community could not endure unemployment of more than half its labor force. Among the Navajos, only the widespread subsistance production and the Navajo ways of extended family sharing have made this rate of unemployment tolerable. However, there are six or seven times as many Navajos today as there were in the years when their own livestock and crops met nearly all their needs. During the next 20 years, give or take a year or two, the population will double again and in each of the next few years around 3,000 young Navajos will enter the labor force.

Some 17,000 or more Navajo and non-Navajo men and women are regularly employed (including self-employment) on the Navajo Reservation, and the full-time equivalent of another 1,000 or more are intermittently employed in contract construction. Table 11 groups this employed

 $<sup>1</sup>_{\hbox{These}}$  figures represent 1973 estimates by the BIA.

TABLE 11

# FULL-TIME EMPLOYED LABOR FORCE BY TRADITIONAL AND NONTRADITIONAL SECTOR AND BY NAVAJO AND NON-NAVAJO EMPLOYMENT

## Navajo Reservation 1969

		n 11 m. n	1	Total Labor Force:
	Total <sup>1</sup>	Full-Time Em		Usual Occupation
	TOTAL-	Navajo	Non-Navajo	
Traditional:	3,700	3,700		7,400
Agricultural	1,800	1,800		2,200
Other Traditio- nal	1,900	1,900		5,200
Nontraditional:	14,500	8,800	4,600	21,900
Nonagricultural	13,400			20,600
Agricultural	100	100		
Contract con- struction	1,000	na	na	1,300
Not Reported				3,300_
TOTAL	18,200	12,600	4,600	32,600

<sup>1/</sup> Rounded to nearest hundred.

Sources: Characteristics of the Manpower Resource, Arizona State

Employment Service, and Employer Demand Survey, 1969

Arizona State Employment Service.

labor force according to traditional and nontraditional sectors and by Navajo and non-Navajo employment as it was in 1969.

Steady employment on the Reservation in the ordinary run of American jobs (i.e., primary, secondary and tertiary occupations) is shown in Table 12. For comparative purposes the percentage distribution of employment by industry is shown for the United States as well as for the Navajo Reservation. For manpower-planning purposes the industrial classification (SIC) followed in the Employer Demand Survey has been adapted to Navajo circumstances. (See also Figure 6, compiled from BIA reports.) The industrial distribution of Navajo Reservation employment is notable in the following respects:

- 1. Government employment dominates the Reservation labor market, and Tribal Government is an important component of the government sector. Three fourths of all jobs for employers (i.e., not self-employment) is government employment; and one half of all full-time work, including self employment, is work for government agencies. As indicated in the following discussion, this work includes not only sub-professional occupations, but also a good many skilled and semi-skilled crafts and service occupations.
- 2. Manufacturing employment constitutes about one half the proportion of total Navajo employment as of total U.S. employment (28 percent). Retail and Wholesale Trade on the Navajo Reservation is one third of the U.S. proportion, and Services employ only one eighth of the U.S. proportion. Low incomes and scattered population account for some of the extreme services discrepancy, but service businesses

are even fewer and smaller on the Reservation than the low incomes and sparse population warrant. The urban population of the town of Gallup, for example, equals less than one fifth the number of Navajo people on the Reservation; yet Gallup has five to ten times more construction contractors, beauty shops, auto dealers and the like.

3. Self employment in traditional agriculture and handicraft production represents one third of all full-time Navajo employment. Sheep raising and the related weaving of Navajo rugs also provide a major part of part-time employment. In BIA statistical summaries over 7,500 Navajos are reported to be engaged in raising sheep and other livestock. The Manpower Resource Survey reported that over 5,000 Navajos were engaged in traditional nonagricultural activities. All but a few hundred were women rug weavers. About 1,900 of these weavers and other artisans were working full-time, i.e., were working as steadily as they cared to and were not seeking additional work.

## B. EMPLOYMENT BY OCCUPATION

Table 13 sets out the major occupational groupings of full-time employment on the Reservation and compares the distribution of Navajos working in these occupations with the distribution of the same occupations in the United States as a whole.

In manpower planning the following characteristics of the occupational demand for Navajo labor seem particularly significant:

FIGURE 6

# NAVAJO TOTAL EMPLOYMENT BY EMPLOYMENT SECTOR, 1967

EMPLOYMENT SECTOR OF THE ECONOMY	PERCENTAGE OF THE NAVAJO ECONOMY (by 1967 Employment)	TOTAL 1	TOTAL NUMBER OF NAVAJOS EMPLOYED
Government		7287	29.3%
Rangeland		8464	34.1%
Service Trades		3011	12.1%
Manufacturing & Processing		928	3.7%
Commercial Trades (Including Tourism)		786	3.2%
Mineral Resources		485	1.9%
Forest		7,00	1.6%
Utilities		194	0.8%
Other		3273	13.2%
Total for All Sectors	: A	24,828	100.0%

Source: Evaluation of Population Support Capacity of the Navajo Reservation, Bureau of Indian Affairs, Navajo Area Office, 1967.

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TABLE 13

EMPLOYMENT, BY MAJOR OCCUPATIONAL DIVISION
Navajo Reservation and United States
1969

	N N	WAVAJO RESERVATION	U.S.	
	Number	% of total	No. % of Total	No.
Occupational Division				
White-Collar Workers	6,220	37.2	47.3	
Professional &	4,450	26.6	13.8	
Technical Managers,	4,430	20.0	13.0	
Officials & Proprie-				
tors	500	3.0	10.2	
Clerical	1,020	6.1	17.2	
Sales	250	1.5	6.0	
Sales	230	1.5	0.0	
Handicraft Artisans & Other Traditional Nonagricultural				
Work	1,900	11.4		
Blue-Collar Workers Craftsman, Foremen, Operatives & Nonfarm Labor except Contract	5,030	30.1	36.2	
Construction	4.030	34.1		
Contract Construction		(est.) 6.0 (e	st.) 4.4	
CONTRACT CONSTRUCTION	1,000	(650.)	31.) 4.4	
Service Workers	1,650	9.3	12.2	
Agricultural Workers	1,900	14.4	4.2	
TOTAL	16,700	100.0	100.0	

1. The demand for Navajo labor is notable, first of all, in the preponderance of professional jobs in human services and of teaching jobs in particular. One of every three regular jobs on the Reservation is held by a teacher, doctor, nurse, social worker, or other human-service professional. Three fourths of these professionals are teachers or other educators and most are non-Navajo. Professionals make up, in fact, the only major occupational group on the Reservation in which a majority of permanent employees are non-Navajo. All other major occupational groups (Clerical, Service, Operative, Craftsmen, etc.), are for the most part Navajo (See Figure 7).

Turnover among non-Navajo professionals on the Reservation is high. Nearly one third of all Navajo men and one half of all Navajo women speak only Navajo and, therefore, lack of Navajo-language capability handicaps non-Navajos in the performance of health, education and welfare services. The BIA has sought to compensate for the lack of Navajo teachers by substantial employment of Navajos in sub-professional positions and Tribal educational programs employ mainly Navajos. Arizona and New Mexico public schools, however, employ few Navajos in professional positions and have few subprofessional positions in their budgets.

2. The apparent discrepancy between the number of Navajo workers in service occupations and in service industries results from the performance of services by government agencies--medical services by Indian Health Service, for example, and food services by government boarding schools.
IV-8

PERCENTAGE OF NAVAJO & NON-NAVAJO EMPLOYMENT, BY OCCUPATIONAL GROUP, 1969

NAVAJO

NON-NAVAJO

PROFESSIONAL & TECHNICAL	MANAGERS, OFFICIALS & PROPRIETORS	CLERICAL	SALES & MERCHANDIZING	CRAFTSHEN & FORENEN	SERVICES	OPERATIVES & LABOR
	П					
764	%09	%59	77%	80%	%06	91%
51%	70%	35%	23%	20%	10%	%6
	Ш					TI. 0

SOURCE: Employer Demand Survey, 1969, Arizona State Employment Service.

3. Perhaps as significant as the differences between Navajo and total United States employment in white-collar occupations is the similarity in the proportion of craftsmen and operatives in the employed labor force of the Reservation and of the United States.

## C. NAVAJO LABOR SUPPLY & CHARACTERISTICS

According to the <u>Manpower Resource</u> preliminary report, the total Navajoland labor force numbered approximately 32,530 in 1967. Of this total 16,600 or 51.3% were women and 48.7% or 15,750 were men. Of the men 55.3% were between 20 and 39, 62.8% of the women in this age group. Labor-force participation is high, amounting to 82 percent of the Navajo population 14 years of age or older, excluding full-time students, but almost two thirds of the labor force were nonemployed at the time of that survey. (See Table 14)

The following summary of characteristics of the Navajo labor force is also based on the preliminary Manpower Resource report.

- 1. The Navajo Labor force is relatively young (See Table 15). This fact is true of both men and women, with nearly two thirds of the labor force in the prime working age range of 20-44 and with almost half under 35 years of age.
- 2. While the Navajos median school-grade achievement is low (5 years or less), a good many have a higher school attainment. Some 3,700 of the 32,360-member labor force reported completing 9-11 school years, another 3,500 had completed 12 years of school, and 850 had

TABLE 14

MEDIAN SCHOOL GRADE ACHIEVEMENT OF NAVAJO EMPLOYED
AND NONEMPLOYED BY AGE AND SEX

1966-67

-		MALE		FEMALE		
AGE	EMPLOYED	NONEMPLOYED	EMPLOYED	NONEMPLOYED		
14-19	9-11	8	8	8		
20-24	9-11	8	12	9-11		
25-29	9-11	6-7	9-11	5 or fewer		
30-34	6-7	5 or fewer	6-7	5 or fewer		

Source: Characteristics of the Manpower Resource, Arizona State Employment Service (Preliminary Report), 1968.

TABLE 15
PERCENT OF NAVAJOS 14 YEARS AND OLDER IN LABOR FORCE

		TRIBE	ON RESERVATION
Male:	14 and 15 years	2.2%	2.6%
	16 to 19 years	14.7%	11.5%
	20 to 24 years	51.9%	42.0%
	25 to 34 years	71.0%	63.7%
	35 to 44 years	66.9%	60.6%
	45 to 64 years	48.9%	44.5%
	65 years and over	10.1%	10.7%
Female:	14 and 15 years	2.8%	3.5%
	16 to 19 years	10.9%	7.0%
	20 to 24 years	41.4%	40.1%
	25 to 34 years	42.5%	45.3%
	35 to 44 years	28.3%	28.9%
	45 to 64 years	16.3%	15.1%
	65 years and over	2.3%	1.5%

Source: Navajo Census, 1970

completed 13 years or more. Both employed and nonemployed are included in each group, with the employed predominating as educational levels advance.

- 3. Many of those persons with little schooling speak no English. One third of the men and one half of the women in the total labor force claimed no knowledge of the English language. An additional 11 percent of the men and 5 percent of the women were reported able to speak English, but not able to read it.
- 4. Most members of the labor force have worked for wages, but a good part of the work force seems unlikely to have provided much in the way of skilled experience.
- 5. Of interest to planners of training programs is that approximately 10,500 men and 10,900 women expressed a desire to train for a new or better job."

## D. EMPLOYMENT, STATUS & UNEMPLOYMENT

Characteristically, BIA and U.S. Census statistics vary considerably. BIA estimates put the Navajo labor force (16 years old and over) at 47,317 in 1973 (Table 16); the 1970 U. S. Census counted only 18,881 persons in the labor force in 1970. (Table 17).

Even when discounting for the labor force contained in the Eastern Navajo Agency, which is tabulated by BIA but not counted by the Bureau of the Census, it is inconceivable that the labor force could have doubled in three years.

 ${\tt TABLE\ 16}$  Population & employment characteristics, bia estimates,  ${\tt 1973}^{\tt 1}$ 

	PERSONS	PERCENT
Population on and advance to reservation	136,686	
Labor Force, 16 years and older	47,317	100.0
Unemployment	16,567	35.0
Temporary Employment	9,845	20.8
Unemployed and Temporarily Employed	26,412	55.8

Source: Department of Interior, Bureau of Indian Affairs, Estimates of Resident Indian Population and Labor Force Status, March 1973.

The Census data contained in Table 18 does little to solve the issue. Judging from the recorded number of persons who were employed during 1969, the labor force (those seeking work and accepting it when it is available), totaled 24,282 on and off the Reservation. Of these, 12,302 lived on the Reservation.

In Table 17 the on-Reservation labor force is given as 5,743 men and 3,768 women for a total of 9,511. This discrepancy is not understood. It is, however, the opinion of this report that while the totals may be wrong the percentages implied in Table 17 and 18 are fairly correct in this case. BIA estimated the total Navajo Labor force of 55.8% were unemployed or temproarily employed in 1973.

<sup>1/</sup> With regard to the desperate need for an accurate data base for the Navajo Reservation, this table should be contrasted with Table 17 taken from the 1970 Census.

TABLE 17

EMPLOYMENT STATUS OF NAVAJOS 16 YEARS OLD AND OVER AND CLASS OF WORKERS

EMPLOYMENT STATUS	TRIBE	ON RESERVATION
Male, 16 years and over	24,447	13,556
Labor Force	11,946	5,743
Percent of total	48.9	42.4
Civilian Labor Force	11,477	5,724
Employed	10,019	4,911
Unemployed	1,458	813
Percent of Civilian Labor Force	12.7	14.2
Not in Labor Force	12,501	7,813
Female, 16 years and over	25,932	15,214
Labor Force	6,935	3,768
Percent of Total	26.7	24.8
Civilian Labor Force	6,884	3,754
Employed	6,269	3,428
Unemployed	615	326
Percent of Civilian Labor Force	8.9	8.7
Not in Labor Force	18,997	11,446
W-1- 16 to 21	6,003	2 1//
Male, 16 to 21 years old Not enrolled in school	2,310	3,144 1,193
Not high school graduate	1,321	724
Unemployed or not in labor force	980	609
CLASS OF WORKER:		
Total employed, 16 years old and		
over	16,288	8,339
Private wage and salary workers	9,501	3,518
Government Workers	6,442	4,636
Locaí Government Workers	2,232	1,763
Self-Employed Workers	306	167
	39	18

TABLE 18

NAVAJO WORKERS IN 1969 BY WEEKS WORKED

	TRIBE	ON RESERVATION
Male, 16 years old and over	14,956	7,392
50 to 52 weeks	6,806	3,185
27 to 49 weeks	3,012	1,546
26 weeks or less	5,138	2,661
Female, 16 years old and over	9,326	4,910
50 to 52 weeks	3,628	2,052
27 to 49 weeks	1,815	934
26 weeks or less	3,883	1,924

The U. S. Census estimated that 56.9% of the Navajo men and 58.2% of the Navajo women on the Reservation were under-employed or unemployed during 1969.

At any rate, the unemployment figures cited in Table 17 can be regarded as useless for planning purposes while the figures in Table 16 may be more useful.

As the BIA statistics appear more internally consistent than the U.S. Census data with respect to employment characteristics the percentages from the BIA breakdown will be utilized in subsequent labor force analysis.

## E. LABOR FORCE POTENTIAL AT LEUPP

Navajos are semi-nomads, traditionally, and followed the game, their flocks and to some degree, the seasons with fairly well established winter quarters. They still regard distance and time with more flexibility than most and for this reason it is unrealistic to limit Leupp's available labor pool to the Leupp community or to the Leupp Chapter.

Figure 8 shows the distances currently travelled by Navajos between residences and places of employment, and although the pattern may seem attractive to the average urban commuter it should be remembered that industrial employment opportunities on the Reservation are few and far between and the firms there are small to medium in size and many of them do not need to draw on labor pools in addition to what local, indigenous populations provide. 86.1% of the employed Navajos now travel less than 30 miles to work.

FIGURE 8

DISTANCES NAVAJO EMPLOYEES TRAVEL BETWEEN PLACES OF RESIDENCE & PLACES OF EMPLOYMENT

0 - 9 Miles		63.0%
10 - 19 Miles	14.6%	
20 - 29 Miles	9.1%	
30 - 39 Miles	5.2%	
Over 40 Miles	8.1%	

Source: "Rural Public Transportation Demonstration Project", Navajo Tribal Office of Program Development, 1974. However, this does not set forth the Navajo's ability to relocate as evidenced in Figure 9 where unemployment in Shiprock, Window Rock, Fort Defiance, Chinle and Tuba City were generated by administrative and industrial activities and resulting employment opportunities rather than by the original distribution of population.

The labor pool available to a Leupp based industry should therefore be considered in three segments:

 Available labor force in Leupp and the Leupp Chapter all within daily community distances.

FIGURE 9
NAVAJO EMPLOYMENT BY LOCATION, 1974

Chinle	2284	
Crownpoint	1149	
Fort Defianc	e 1925	
Ganado	311	
Kayenta	571	
Navajo	697	
Shiprock		3616
Tuba City	1762	
Window Rock	2100	
Other		2813
TOTAL		17,288

Source: "Public Rural Transportation Demonstration Project", Navajo Tribal Office of Program Development, 1974.

- Additional labor force from outside the Leupp Chapter but within the Tuba City Agency mixed between laborers within commuting distance and laborers relocated to Leupp.
- Laborers totally relocated to Leupp from the rest of the Navajo Reservation as a result of Leupp based employment opportunities.

Because of the geographical distribution of the Navajos, the dispersed location of BIA and Arizona Public Schools, the mobility of the Navajo labor force and the generally prevailing unemployment and underemployment on the Reservation, the supply of trainable and inexpensive labor is as abundant at Leupp as at any other Reservation settlement.

(See Table 19)

With an estimated available labor force of 8,023 in the Tuba City Agency where Leupp is located; with 2,920 persons under-employed and 2,527 unemployed for a total of 5,447 persons potentially available for fulltime employment anywhere in the Agency; with the rest of the unemployed Navajo labor force available to supplement the local labor supply through relocation; and with the proven trainability of the inexperienced Navajo worker, labor intensive undustries wishing to locate at Leupp should experience no labor supply difficulties.

Labor characteristics as discussed in this chapter as well as the skill development programs discussed in Chapter X, pertaining to the Navajo work force in general, apply to Leupp as well.

TABLE 19

POPULATION & EMPLOYMENT STATUS
TUBA CITY AGENCY, 1973

STATUS	MALE	FEMALE	TOTAL	%
Resident Indian Population	12,353	12,592	24,945	100.0%
Under 16 years of age	6,178	6,239	12,417	49.8%
Total 16 years old and over	6,175	6,353	12,528	100.0%
16-19 years	1,135	1,099	2,234	17.7%
20-24 years	1,035	1,088	2,123	17.0%
25-34 years	1,591	1,711	3,302	26.4%
35-44 years	1,030	1,108	2,138	17.1%
45-64 years	993	1,043	2,036	16.3%
65 years and over	391	304	695	5.5%
Not in Labor Force (16 years +)	2,825	2,220	4,505	36.0%
All Students (16 years +)	1,216	1,099	2,315	18.5%
Available Labor Force (16 years +)	3,890	4,133	8,023	100.0%
Employed	2,638	2,858	5,496	68.5%
Permanently Employed	1,503	1,073	2,576	32.1%
Temporarily Employed	1,135	1,785	2,920	36.4%
Unemployed	1,252	1,275	2,527	31.5%
Activity Seeking Work	975	600	2,025	25.2%

Source: Annual Report of Employment and Unemployment, 1973.

Bureau of Indian Affairs, Branch of Social Services,

Branch of Employment Assistance.



## CHAPTER V

REGIONAL LOCATION PARAMETERS



## A. MARKET CONCENTRATION AND DISTANCES

Leupp is located within 500 miles or about 10 hours driving distance of around 20 million people, and within 800 miles or 16 hours driving time of over 33 million people. See Table 20. The "near" market population within overnight delivery distances includes Phoenix, Tucson, Los Angeles, San Diego, Long Beach, El Paso and Albuquerque, Denver. Colorado Springs and Salt Lake City.

TABLE 20
CUMULATIVE POPULATION & POPULATION BY DISTANCE ZONE FROM LEUPP

DISTANCE ZONE	ZONE POPULATION	CUMULATIVE POPULATION
0-100	126,230	126,230
101-200	1,512,440	1,638,670
201-300	1,336,700	2,975,370
301-400	4,341,729	7,317,099
401-500	12,127,241	19,444,340
501-600	3,301,594	22,745,934
601-700	6,880,582	29,626,516
701-800	3,683,115	33,309,631

Source: Cleartype Business Central Atlas, 1974 ed., Am. Map Co., Inc., N.Y., and U. S. Bureau of Census, 1970.

The secondary market within a "day and a night" delivery time includes

San Francisco, Oakland, Stockton, Sacramento, San Jose, Boise, Billings,

Casper, Houston, Austin, Oklahoma City, Dallas-Ft. Worth and many other

urban centers in Western and Mid-Western states.

The total of the urban populations in Table 21 is located within a weighted average distance of 700 miles from Leupp.

One unique feature of Leupp's market position is its centrality to markets in all geographic directions. The major market concentrations are as expected the large population and industrial areas on the west coast. The central advantage of the Leupp location can best be seen in Figure 1, which is shown in Chapter I for reference purposes.

Railway transit times to an even larger area are shown in Table 22.

Note again Leupp's central location between mid-West and West coast urban centers.

TABLE 21
POPULATION CENTERS BY DISTANCE FROM LEUPP

CITY	STATE	POPULATION	MILES
Flagstaff	Arizona	26,117	40
Phoenix	Arizona	581,562	150
Tucson	Arizona	262,933	220
Las Vegas	Nevada	125,787	240
		243,751	260
Albuquerque Santa Fe	New Mexico		
	New Mexico	41,167	300
Las Cruces	New Mexico	37,857	330
El Paso	Texas	322,261	380
Roswell	New Mexico	33,908	400
Provo	Utah	53,131	3 60
Salt Lake City	Utah	185,885	400
San Bernardino	California	104,783	370
Pasadena	California	112,981	420
San Diego	California	740,200	400
Los Angeles	California	2,777,800	430
Santa Barbara	California	70,215	510
Bakersfield	California	75,700	460
Fresno	California	174,100	510
Boulder	Colorado	74,100	460
Denver	Colorado	514,000	450
Colorado Springs	Colorado	183,000	430
Ogden	Utah	69,478	425
San Francisco	California	682,500	660
Oakland	California	346,100	650
Stockton	California	114,100	610
Sacramento	California	263,900	630
San Jose	California	524,000	630

TABLE 21 Con't

CITY	STATE	POPULATION	MILES
Boise	Idaho	74,990	650
Pocatello	Idaho	40,036	540
Billings	Montana	61,581	750
Casper	Wyoming	39,361	590
Amarillo	Texas	127,010	540
Lubbock	Texas	140,101	550
Dallas	Texas	844,401	850
Ft. Worth	Texas	393,476	820
San Antonio	Texas	654,153	850
Austin	Texas	251,808	870
Houston	Texas	1,232,802	1,010
Oklahoma City	Oklahoma	368,856	770
Tulsa	Oklahoma	330,350	870
Witchita	Kansas	266,766	790
Topeka	Kansas	139,764	900
Kansas City	Kansas	179,409	950

Source: U.S. Bureau of the Census, 1970

TABLE 22

RAILWAY TRANSIT TIME FROM WINSLOW, ARIZONA TO:

TOWN	DELIVERY TIME (DAYS)
Baltimore	8
Chicago	4
Dallas	4
Denver	4
Los Angeles	3
New Orleans	6
New York	8
Phoenix	overnight
San Diego	3
Seattle	5
St.Louis	4
Tucson	2

Source: Atchison, Topeka and Santa Fe Railroad

B. REGIONAL ECONOMIC ACTIVITY & COMPETITIVE INDUSTRIAL LOCATIONS
Leupp's competitive area, envisioned as the area where Leupp may
benefit from industrial infrastructure on the one hand and suffer
from industrial location competition on the other hand, extends
no more than 100 miles from Leupp.

The reasons for the limited area are: (1) Firms who need a reasonably mature level of industrial infrastructure or immediate market access will not select Leupp as a location, but will settle in industrial urban centers at least beyond a hundred mile radius and are not in the group of firms Leupp has the power to compete for.

(2) Firms with relatively low infrastructure and market access requirements could conceivably settle anywhere in the Nation, but if distance, transportation, and other market factors of a central Arizona location are ideal for a given firm, Leupp would have to compete for this firm on the basis of its labor skills, cost of labor, quality of park facilities and lease arrangements. Competitive industrial site locations in the Leupp area are:

TABLE 23

COMPETING INDUSTRIAL LOCATIONS IN THE LEUPP AREA

CITY	ROAD MILES		POPULATION CHANGE	LABOR
	FROM LEUPP	POPULATION	1960-1970	FORCE
Flagstaff	55	26,117	+43.4%	10,069
Williams	85	2,386	-33.0%	1,422
Prescott	144	13,134	+ 2.1%	4,639
Winslow	25	8,066	- 9.0%	3,630
Ho1brook	58	4,759	+38.4%	2,141

Source: U. S. Bureau of the Census, 1970 and the Chamber of Commerce in each City, 1974.

 <u>Flagstaff</u>. The Flagstaff economy is based mainly on tourism, trade, education, and the lumbering industries. However, the manufacturing sector is on the increase.

Flagstaff's location at the junction of I-40 and I-17, plus its closeness to many major recreation and scenic areas, make the tourism sector a most important source of employment. Flagstaff is also a trade and service center for a wide area of north central Arizona.

Northern Arizona University is the major employer in Flagstaff, and helps to bolster the large "services" and "Government" sectors in the Coconino County.

TABLE 24
INDUSTRIAL PROFILE FOR 1972

COCONINO COUNTY ECONOMIC SECTORS	1972 ANNUAL AVERAGE COCONINO COUNTY EMPLOYMENT		
	Number	% of Total	
Manufacturing	1,625	7.1	
Mining & Quarrying		0.1	
Contract Construction	3,125	13.7	
Transportation, Communication,			
Public Utilities	950	4.2	
Wholesale/Retail Trade	4,175	18.4	
Finance & Insurance &			
Real Estate	475	2.1	
Service	4,100	18.1	
Government	6,600	29.1	
Other	1,400	6.2	
Agriculture	225	1.0	

Source: Office of Economic Planning & Development, 1973

A recent survey of the Flagstaff labor force indicates that in addition to an unemployment rate of 3.8% there are several persons in a "latent" labor force for a total number of 685 available workers. Of these, however, 470 are in clerical, sales and service occupations.

Flagstaff has several industrial areas with proximity to utilities and rail and highway transport, but there is no industrial park per se and land prices are high. Finally, with regard to location parameters, property taxes in the Flagstaff area are as follows:

TABLE 25
FLAGSTAFF
PROPERTY TAX (per \$100 assessed valuation)

	1971	1972	1973	
Inside Flagstaff	\$12.53	\$11.82	\$10.09	
Outside Flagstaff	\$ 9.33	\$ 8.62	\$ 7.59	
Sales Tax				
State	3%	3%	3%	
City	1%	1%	1%	

2. Williams. With a current (1970) population of 2,386, the minor town of Williams on I-40 and the AT & SF 30 miles west of Flagstaff, declined 33.0% between 1960 and 1970. The labor force total 1,422 with an amazingly large number, 533 or 37.5%, employed in services sectors. See Table 26.

Unemployment in Williams was around 6.5% in 1971 and may be higher now.

Williams has a good industrial area adjacent to the AT & SF and I-40 but no zoned and planned industrial park. Lot prices and taxes are comparable with those in Flagstaff.

TABLE 26

EMPLOYMENT BY TYPES OF INDUSTRIES - WILLIAMS, ARIZONA
August, 1971

Industry	% of Labor Force	
Manufacturing	0.8	
Mining and Quarrying	0.2	
Contract Construction	3.8	
Transportation	4.4	
Communications	4.4	
Public Utilities	6.7	
Wholesale/Retail Trade	17.9	
Finance, Insurance, Real Estate	2.8	
Services	37.5	
Government	17.9	
Agriculture (including lumbering) TOTAL	$\frac{3.6}{100.0}$	

Source: Williams Employment Survey, 1971.

3. Prescott. A City of 13,117, a labor force of 4,639, Prescott is growing rapidly as a retirement town for the Phoenix population and an increasing number of persons employed in Phoenix commute to work from their residence in Prescott. (See the Services section in Table 27.) Because of this population pattern, labor force participation is only 35.4% and the philosophy of development people in Prescott is to attract many small business rather than a vew big firms; they do not want to suffer the economic impacts of mass layoffs and strikes

TABLE 27
PRESCOTT EMPLOYMENT BY SECTOR, 1970

	EMI	PLOYMENT
	NUMBER	PERCENT
Agriculture	113	2.5
Mining	42	1.0
Contract Construction	380	3.6
Manufacturing	443	10.1
Transportation, Communication,		
Public Utilities	248	5.7
Wholesale/Retail Trade	1,003	22.8
Finance, Insurance & Real Estate	225	5.1
Services	1,632	37.2
Public Administration	305	7.0
TOTAL	4,391	100.0
Source: U. S. Bureau of Census, 19	970.	

In 1970, unemployment in Prescott was only 3.8% and has traditionally been lower than in surrounding areas. It is further estimated that the local indian tribe, the Yavapai, can at the very most provide around 30 workers to any prospective employer. There are three industrial parks in the area:

a. The Airport Industrial Park, owned by the City of Prescott, has a total of 120 acres and is located seven miles northeast of Prescott adjacent to the Prescott Municipal Airport and U. S. 89. The park is adjacent to a branch line of the Santa Fe, and existing siding and spur track is available on site. Paved roads provide access to U.S. 89. Sites are available for both sale and lease. At present, U.S. Electrical Motors, with 560 employees, Airborne Navigation, Inc. with 30 employees and Plastalog, Inc. with 10 employees

located within the industrial park, which is 40% occupied.

- b. The Santa Fe Industrial Park is located on a 40-acre site, with lots of varying size, adjacent to the railroad depot and tracks in downtown Prescott. The park is 45% occupied with 22 acres remaining vacant. The remaining lots are small, however, and a single demand for more than 10 acres cannot be met.

  Moreover, only heavy rail users are considered as tenants.
- c. A 12-acre commercial park is now being developed by the Yavapai Indian Reservation off State Highway 69 adjacent to the City of Prescott. The land is owned by the Yavapai Tribe and, therefore, has Reservation status in regard to such things as leasing and taxation. Water and sewer utilities will be available on site. At this writing, the tribe has no prospective tenants for the park.

Prescott, in summary, appears competitive with potential developments at Leupp with regard to physical facilities and transportation but with only 167 unemployed persons in Prescott in 1970 and when considering the small size of the Yavapai Tribe (160 persons), the area does not seem able to provide the large trainable work force required by most industries

4. <u>Holbrook</u>. Since 1960, Holbrook's population has been increasing rapidly to present population of nearly 5,000, but since the work

force is primarily engaged in transportation related activities (AT & SF and I-40) and in trade and services, the labor force does not directly compete with Leupp.

No industrial development effort exists in Holbrook and land prices and taxes are in line with other small towns in Arizona.

TABLE 28
HOLBROOK PROPERTY TAX (per \$100 assessed valuation)

	1971	1972	1973
Inside Holbrook	\$9.40	\$9.68	\$8.08
Inside Holbrook	\$8.05	\$8.25	\$7.59
Sales Tax			
State	3%	3%	3%
City	0	0	0

The State of Arizona has a 4% sales tax effective July 1, 1974.

5. Winslow. The population of Winslow declined between 1960 and 1970 but may have stabilized in recent years around a population of 8,000. The labor force is fairly small relative to population indicating an aging town with an increasing number of retired persons.

Table 29, industrial profile for Navajo County, shows a heavy dependence upon transportation, services and government. The large manufacturing sector is caused by the Snow Flake paper mill and lumber industry to the south and by recent establishment of new and local industry.

TABLE 29
INITIAL PROFILE, NAVAJO COUNTY

	1972 ANNUAL AVERAGE		
NAVAJO COUNTY	NAVAJO COUNTY EMPLOYMENT		
ECONOMIC SECTORS	NUMBER	% OF TOTAL	
	1 200	0.0	
Manufacturing	1,200	9.0	
fining & Quarrying	210	1.6	
Contract Construction	600	4.5	
Fransportation, Communi-			
cation & Public			
Utilities	1,400	10.5	
Mholesale/Retail Trade	2,175	16.3	
inance, Insurance, and			
Real Estate	240	1.8	
Services	2,725	20.4	
Government	3,475	26.0	
ther	1,125	8.4	
Agriculture	200	1.5	

There are a number of industrial sites in Winslow ranging in size from 29 to 230 acres. The City of Winslow owns 200 acres of land which is zoned for industrial purposes. This land is immediately adjacent to the Winslow Municipal Airport, and has a full range of utilities available. There are no tenants at present.

Lease arrangements and taxes are fairly representative for the area:

TABLE 30
WINSLOW PROPERTY TAX (per \$100 assessed value)

	1970	1971	1972
Inside City Outside City	\$7.87 \$6.37	\$8.43 \$6.93	\$7.81 \$6.31
Sales Tax			
State City	3% 1%	3% 1%	3% 1%

6. <u>Hopi Indian Reservation</u>. Based on data from a "Social and Economic Survey" by the Hopi Agency, BIA, January 1973, the Hopi population grew 7.1% from 6,132 to 6,567 between 1970 and 1973.

Labor force characteristics are as follows:

TABLE 31 1973 EMPLOYMENT DATA HOPI INDIAN RESERVATION

	MALE	FEMALE	TOTAL
TOTAL Indian Population	$ \begin{array}{c} 3,208 \\ (1,411) \\ (\underline{603}) \\ 1,194 \\ (\underline{624}) \\ 570 \end{array} $	3,359	6,567
Persons Under 16 years		(1,449)	(2,860)
Persons not in labor force		(1,122)	( <u>1,725</u> )
Available labor force		788	1,982
Current Employment		( <u>378</u> )	( <u>1,002</u> )
Unemployment		410	980

Source: "Report on Labor Force", BIA, Hopi Agency, March 1973. (Parentesis indicate estimates.)

The unemployment among the Hopi was 49.5% in 1973, not much better than among Navajos in the same area. And, if at all possible, the Hopi industrial profile is more unbalanced than that of the Navajos.

TABLE 32
HOPI EMPLOYMENT BY ECONOMIC SECTOR

Sector	Percent Employment
Agriculture	6.9
Construction	0.6
Craft Manufacture	16.2
Government	47.6
Manufacturing	9.8
Retail trade and service	18.9

Source: "Social and Economic Survey", BIA, Hopi Agency, January, 1973

Governmental agencies, federal and tribal, are the largest employers on the reservation providing approximately one-half of all employment. Self-employment in agriculture and small retail and service business' accounts for roughly one-quarter of employment. One small manufacturing facility producing electronic components is located on the reservation.

Other economic activity includes cattle and sheep raising, coal mining, tourism, and craftwork. The Hopi Tribe is actively pursuing further economic development and has developed a 220 acre industrial park adjacent to Winslow, 65 miles south of the reservation. The park's facilities include complete utilities and transportation facilities. Until recently the park has on tenant employing 240 people including 90 Hopi. This enterprise is now terminated, the industrial building owned by the Hopi Tribe is empty and the park has no tenants.

This park is a competitor to Leupp as it is near rail and air carrier services. However, although the lease arrangements with the Hopi Tribe may be similar to what the Navajo Tribe can provide, the tax situation is not.

The State of Arizona does not tax Indian Lands and Indian-owned property on reservations. Incomes of indians residing on reservations are also not taxed if wholly derived from reservation sources. Indian people of Arizona are exempt from state and local taxes on consumer goods purchased on the reservation, unless such taxes are imposed by the tribal government.

tax the property and business transactions of non-Indians who oper-

ate on reservations. The current Hopi Indian Reservation property tax rate is \$4.74 per \$100 assessed valuation including inventory.

In conclusion, once the location advantages are minimized and a prospective firm starts to look at labor force availability, labor costs, skills, lease arrangements and taxes, the major competitor to a Leupp location remains the Hopi Industrial Park at Winslow. Despite the Arizona property tax, the park is attractive to industry because it is developed with readily available utilities.

On the other hand, a well developed industrial park at Leupp can equalize all location factors of the Hopi park with exception of direct rail access and distance to an interstate highway.

For the proposed Leupp Industrial Park to gain an advantage over the Hopi Industrial Park will therefore require consideration of all Leupp's attributes and an industrial park master plan which seeks to maximize the combined attractiveness of Leupp's economic factors.

Feasibility of Leupp as an industrial center, consequently, depends to a major degree on actual physical planning and development of an industrial park and a community infrastructure.

## C. PREVAILING WAGE RATES.

In the following table, the mid-50's range can be regarded as maximum for the on-Reservation labor force with the average hourly rates being correspondingly lower. Note particularly the cost advantages in electronics assembly, drafting and production (production machine operation).

TABLE 33

WAGE RATES IN NORTH CENTRAL ARIZONA, 1973

JOB TITLE	MINIMOM	MEDIAN OR AVERAGE	MID-50% RANGE	STARTING
Tool & Die Maker  Electronic Assembler 3  Electronics Assembler 2  Electronics Assembler 2  Electronics Assembler 6  Electronics Assembler 7  Electronics Assembler 6  Electronics Assembler 7  Electronics Assembler 8  Elec	1.60		4.10-4.81 2.72-3.12 2.28-2.65 2.06-2.38	
Electrician (Inside) (Unton) Electrician, Maitnenance (Non-union) Fork Lift Operator (Warehouse)	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	8.95	4.01-4.64	3.00=5.00
Material Haudler (NIS.) Janitor, Porter, or Cleaner Machinist, Maintenance (NIS.)	N		2.36-3.02 1.66-2.10 4.12-4.50	1 . 7 5 2 . 00
Machinist A Machinist B Equipment Operator A		4.05	4.45-5.27 3.78-4.61 4.10-4.50	3.50-3.78
Shipping Clerk Receiving Clerk Shipping C. Receiving Clerk		0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	2.15-3.07 2.53-3.04 3.02-3.22	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
• d 1 1		3 30	2,62-3,34 3,08-3,63 2,20-2,65	
Stenographer Lecinical Clerk Typist. Plumber (Journeyman) (Non-union).		421/m 7.74	o 377-489/mo	350-400
Plumber, Laborer Carpenter, Maintenance Dreftsman, Electronic	3,000	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	3.444.33	2.90-5.64
Clerk, Payroll. Clerk, Accounting A. Clerk, Accounting B.			2.29-2.72 2.63-3.19 2.13-2.59	
Switchboard Operator Switchboard Operator (Wotel) Production Machine Operator Tabores, Construction (Union) Laborer, General SOURCE: Arizona State Department of Employment Security, 1973.	1.75 1.75 5.23 Employment Security, 1973		1.88-2.17 1.60-1.90 2.25-2.65	1.86-1.90 2.25-2.65 1.75-3.00



# CHAPTER VI

SELECTION OF PROSPECTIVE INDUSTRIES



#### A. INTRODUCTION

Several considerations should guide the search for industries compatible with Leupp and the selection process should seek to identify such firms whose presence in Leupp: (1) would offer broad employment opportunities to area residents, (2) would not need excessively high skill levels during the first years of development, (3) would not conflict with basic Navajo cultural values and traditions and, (4) would not be an excessive water user or a source of environmental pollution.

From the point of view of the firm, the attractiveness of Leupp as a prospective location will depend on several factors. Industries deciding to locate in Leupp should find the city uniquely conducive to the conduct of their businessand the resources available in or near Leupp should be those required by the firm in its operations; in addition, community amenities and features such as schools, public facilities of other types, recreational opportunities, etc., should conform to the expectations of the prospective firm's personnel who may be asked to relocate with the firm. Thus, the final criteria guiding search for firms to locate or relocate in the proposed Leupp Industrial Park should be the degree to which the resources and related requirements of a particular firm and industry are met by the Town and its environs.

In this chapter is compiled a list of 50 prospective industries which are suitable for recruitment to locate in the proposed Industrial Park.

This compilation is based on a matching of the Leupp area's resources with the critical requirements of alternative industrial groups. The 50 industrial groups listed according to three and four digit Standard Industrial Classification (SIC), are ranked in terms of their compatibility with the resource base at Leupp and the procedures for ranking industries, the weighting processes and selection procedures are described below.

#### B. FACTOR SELECTION AND ANAYLSTS

The factors used to identify industries suitable for recruitment to Leupp do not include every possible variable which might affect the willingness of a particular firm to relocate in the area. Some of the more elusive and difficult to quantify factors were not considered. These included climate and social or cultural amenities, which may have particular significance for certain industry groups or firms. The inclusion of such additional factors might change the final priority ranking of identified industries. It is presumed, however, that such refinements would have little effect in determining whether an industry appears in the final listing.

The factors listed and discussed below were those deemed to be particularly critical in finding firms to locate or relocate at Leupp. These factors are important from the standpoint of industies needs as well as Leupp's resources and limitations.

Listed below are the factors upon which each industry was scored for compatibility with Bisbee:

- 1. Water usage
- Labor intensity
- Labor skill levels
- 4. Industry's growth rate in United States
- 5. Transportation sensitivity of input factors
- 6. Transportation sensitivity of products
- 7. Industry already on reservation
- 8. Expressed interest in a Reservation location by industry

Information was gathered and analyzed on most industry groups according to the four-digit SIC code to provide the basis for scoring industries on each factor and for ranking industry groups to determine a priority in recruitment efforts. 1

Each industry group was scored on each factor using a 9-point scale, except for water which uses a 15 point scale. Weighting constants then were applied to each factor to reflect its relative importance. Those factors deemed least important were assigned a weight of 1 while the most important factors were weighted at 10. The highest total score obtainable on any factor for any one industry would be 9 (the highest score) times 10 (the most important factor) or 90. The number of SIC digits utilized, the weighting constants applied and the maximum possible scores for each factor are summarized in the following

 $<sup>^{\</sup>rm l}$  Limitations on available data necessitated the use of three-digit industry groups for several factors.

 $<sup>^2\</sup>mathrm{The}$  relative importance of each factor is based on the judgment of the contractor and it should be noted that although other weights could have been used, different weights indicating relative factor would likely have led to the indentification of the same or similar industry groups.  $_{VI-3}$ 

table. A detailed discussion of each factor follows on subsequent pages.

TABLE 34
INDUSTRY SELECTION FACTORS

FACTOR	SIC DIGITS	WEIGHT	SCORE RANGE
later Use & Pollu-	4	6	6-54
abor Intensity	3	10	10-90
abor Skill Levels	3	4	4-36
industry's Growth	3	5	5-45
ransportation Sensitivity, Inputs	4	7	7-63
ransportation, Sen- sitivity, Outputs	4	6	6-54
lready on Reservation	on 4	2	2-18
xpressed interest in the Reservation	4	1	1-9

## C. WATER USE

At the present time the Leupp water system is not capable of supporting industries which consume large quantities of water nor does the town presently have facilities for the treatment of industrial water waste. Therefore, industries which require large amounts of water (more than 15 gallons per dollar of value added) were eliminated from consideration as prospective recruits. Industries which remained in consideration after this initial screening were then scored on the amount of water that they did use. Industries which use less than 2 gallons of water per

dollar of value added were given a score of nine on this factor. Other scores on water usage were assigned as indicated in Table 35.

TABLE 35

SCORE ASSIGNMENTS INDUSTRY WATER USE

GALLONS/DOLLAR OF	BASIC		POSSIBLE SCORES
VALUE ADDED	SCORE	WEIGHT	ON WATER USE
1.99 gal/\$	15	6	90
2.99 ga1/\$	14	6	84
3.99 gal/\$	13	6	78
4.99 gal/\$	12	6	72
5.99 gal/\$	11	6	66
6.99 gal/\$	10	6	60
7.99 gal/\$	9	6	54
8.99 gal/\$	8	6	48
9.99 gal/\$	7	6	42
10.99 gal/\$	6	6	36
11.99 gal <b>/</b> \$	5	6	30
12.99 gal/\$	4	6	24
13.99 gal/\$	3	6	18
14.99 gal/\$	2	6	12
15.99 gal/\$	1	6	6

#### D. LABOR INTENSITY

Since the major resource at Leupp consists of a large number of unemployed persons it was deemed appropriate that industries which are highly labor intensive should be given highest priority in any recruitment effort. Accordingly, the prospective industries were scroed on labor intensity, with the most labor intensive industries receiving the highest score. Labor intensity was judged on the basis of total production worker's wages as a percentage of total value added. Industries were scored on this factor as shown in Table 36.

TABLE 36,
SCORE ASSIGNMENTS: LABOR INTENSITY

BASIC		POSSIBLE
SCORE	WEIGHT	SCORES
9	10	90
8	10	80
7	10	70
6	10	60
5	10	50
4	10	40
3	10	30
2	10	20
1	10	10
	9 8 7 6 5 4 3	SCORE WEIGHT  9 10  8 10  7 10  6 10  5 10  4 10  3 10  2 10

## E. LABOR SKILL LEVEL

Among Leupp's unemployed there are some skilled workers, but most are semi-skilled or unskilled with little or not employment experience. Since skilled labor demands considerably higher pay than average industry wages, a surrogate measure of the degree to which an industry's labor force is semi-skilled or unskilled is given by the level of wages of production workers in that industry. The average wages paid to production workers in each industry classification were, therefore, used to compute a skill-level index. Industries whose production workers earned more than \$5.00 per hour were considered to use highly

skilled workers. The skill-level index for labor was computed by dividing an industry's prevailing wages by \$5.00. Industries with an index greater than or equal to \$1.00 were considered to have low compatibility with the available labor pool. Scores of less than unity according to this criterion reflect the use of relatively less skilled workers. The scores assigned to labor skill levels are shown below in Table 37.

TABLE 37

SCORE ASSIGNMENTS: LABOR SKILL LEVEL

SKILL LEVEL INDEX	BASIC SCORE	WEIGHT*	POSSIBLE SCORES
less than .50	9	4	36
0.50 - 0.62	8	4	32
0.63 - 0.74	7	4	28
0.75 - 0.87	6	4	24
0.88 - 0.99	5	4	20
1.00 - 1.12	3	4	12
1.13 - 1.24	2	4	8
1.25 and over	. 1	4	4

<sup>&</sup>lt;sup>1</sup>The relatively low weight reflects the trainability of the Navajo labor pool and was set at "4" so that an industry which is highly compatible with Leupp but requires skilled labor will not be unduly penalized in the total scoring.

## F. INDUSTRIAL GROWTH RATE IN THE UNITED STATES

It was decided that the general growth rate of each industry grouping should be considered in the classification of industries to be recruited. First, any efforts toward recruiting an industry currently in decline nationally might at best be only a temporary positive factor in Leupp's economy; a plant from such an industry after locating in Leupp might be phased out after a year or two, and the efforts expended on this firm would have been wasted. Secondly, a firm in an industry currently in a period of growth would tend to be interested in opening new plants and would probably be most interested in potential new sites. The measure of growth used for this analysis was the percentage increase in size of labor force of production workers in each industry during the period from 1963 to 1970. (Because of biases generated by the recent recession, more recent data were not used and January, 1970, was used as the end of the base period.) The labor force data were collected and analyzed according to three-digit SIC codes. Based on this information, each three-digit industry group was scored on growth according to the weights shown in Table 38.

TABLE 38
SCORE ASSIGNMENTS: NATIONAL INDUSTRIAL GROWTH RATE

% OF LABOR FORCE	COMPUTATION	BASIC		POSSIBLE	
GROWTH	FACTOR	SCORE	WEIGHT	SCORES	
Positive Growth:					
More than 10%	1.10 & Over	9	5	45	
0 - 9.9%	1.00 - 1.099	8	5	40	
Negative Growth:					
0 0 07			_	2.0	
0-9.9%	0.90 - 0.99	4	5	20	
10-19.9%	0.80 - 0.89	3	5	15	
20-29.9%	0.70 - 0.79	2	5	10	
More negative					
than 30%	0.69 or less	1	5	5	

#### G. TRANSPORTATION SENSITIVITY, INPUTS

The ability of a firm to operate effectively in any location depends to a large extent on the types of inputs the firm requires; whether they are available locally; or whether transportation costs will be high or low. Each prospective industry was scored on the extent of its use of nonlabor inputs in its productive processes. An industry received a high score on this factor if it required (1) few material inputs (raw materials or intermediate products); (2) requisite materials which are not particularly distance sensitive; or (3) requires materials which are available locally. The resource

or (3) requires materials which are available locally. The resource requirements of each prospective industry were individually evaluated according to the three criteria cited above. (The scores assigned to the various industries in this regard obviously are affected by the region's industrial infrastructure; this fact was, therefore, considered in the scoring procedure.)

#### H. MARKETING CONSIDERATIONS

Marketing logistics were evaluated in a manner similar to the process described above for resource logistics to determine the level of difficulty each industry would encounter in transporting their product to prospective buyers. An industry would rate highly on this factor if: (1) the finished product is not particularly distance sensitive; or (2) most markets are within a reasonable distance from Leupp. The market accessibility factor is considered slightly less important than the resource availability factor.

#### I. INDUSTRIES ALREADY ON THE NAVATO RESERVATION

Firms already located on the Reservation have proven beyond the need of a statistical selection process that they are compatible with Navajo Nation resources. The industrial groupings in which these firms fit were given 50 additional points toward their total score.

It is characteristic of statistical formulae that they aggregate individual input within a sample. Since for Leupp no industries were considered which use more than 15 gallons of water per dollar of value added in production, some of the industries now on the Reservation (particularly in the eastern section around Shiprock), may not be found in the final listing of industries compatible with Leupp.

In this context,it should be kept in mind that the Navajo Nation comprised a vast land area where local resource combinations vary considerably; what is suitable in the vicinity of Burnam Trading Post may not find a basis for existance in the Leupp Area.

## J. INDUSTRIES WHICH HAVE EXPRESSED INTEREST

Whenever a firm contacts the Tribal Office of Development or after having been contacted by that office, expresses interest in a Navajo location, it can be presumed that the firm's site selection team has evaluated the Reservation's industrial locations fairly thoroughly. Since interest is still expressed it can be concluded that a Reservation location must be reasonably compatible with the firm's input requirements. The industrial groupings in which these firms belong have,

therefore, been given 25 points towards their total score. Again, however, if these firms are more compatible with locations which permit high water consumption they will not be found in the listing of industries for Leupp.

K. Scored for compatibility between industrial input requirements and the resource base at Leupp, these 50 industrial groups were the most suitable for locating at Leupp:

TABLE 39

INDUSTRIES MOST COMPATIBLE WITH THE LEUPP RESOURCE BASE

SIC CODE	INDUSTRY	SCORE	RANK	
3141	Shoes, Except Rubber	269	1	
3900	Jewelry, Silverware & Plated Ware	263	2	
3931	Musical Instruments & Parts	260	3	
2844	Toilet Preparations	257	4	
3641	Electric Lamps	253	5	
3961	Costume Jewelry	251	6	
2941	Games & Toys	249	7	
3822	Automatic Temperature Controls	249	8	
3586	Measuring & Dispensing Pumps	246	9	
3643	Lighting Fixtures	246	10	
2842	Polishes & Sanitation Goods	243	11	
3574	Calculating & Accounting Machines	239	12	
3692	Primary Batteries, dry & wet	232	13	
3820	Mechanical Control Devices	230	14	
3821	Mechanical Measuring Devices	230	15	
3622	Industrial Controls	227	16	
3950	Office & Art Goods	224	17	
2500	Furniture & Fixtures (General)	222	18	
3694	Engine Electrical Equipment	222	19	
3640	Lighting & Wiring Equipment	222	20	
3411	Metal Cans	215	21	
3572	Typewriters	215	22	
3542	Machine Tools, Metal Forming	212	23	
3651	Radio & T. V. Receiving Sets	210	24	
3498	Fabricated Pipe & Fittings	209	25	
3581	Automatic Merchandizing Machines	205	26	
2511	Wood Household Furniture	204	27	

TABLE 39 Con't

SIC COD	E INDUSTRY	SCORE	RANK
3541	Machine Tools, Metal Cutting	200	28
3494	Valves & Pipe Fittings	199	29
3580	Service Industry Machines	199	30
3631	Household Cooking Equipment	198	31
2590	Miscellaneous Furniture & Fixtures	195	32
2649	Converted Paper Products	193	33
3672	Cathode Ray Picture Tubes	193	34
3253	Ceramic Wall & Floor Tile	188	35
3551	Food Products Machinery	188	36
2715	Truck Trailers	188	37
3811	Engineering Scientific Instruments	188	38
3537	Industrial Trucks & Tractors	184	39
3553	Woodworking Machniery	184	40
3545	Machine Tool Accessories	184	41
3650	Radio & T.V. Receiving Equipment (Gen.)	180	42
2522	Metal Office Furniture	172	43
3540	Metal Working Machinery	170	44
2087	Flavoring Extracts & Syrups	166	45
3532	Mining Machniery	160	46
3561	Pumps & Compressors	159	47
3443	Fabricated Platework, Boiler Shops	157	48
3444	Sheet Metal Work	146	49
3433	Heating Equipment, except electrical	139	50

Derivation: Gordon Herkenhoff & Associates, Inc., 1975

There are many, many firms in other industrial categories with individual resource requirements compatible with a Leupp location and each interested firm should always be processed on its own merits. The numerical ranking in Table 39 should, therefore, not be followed slavishly. The listing does, however, provide a starting point for an industry contact program.

# CHAPTER VII

EVALUATION OF THE LEUPP INDUSTRIAL SITE



#### A. GENERAL DESCRIPTION:

1. Orientation and Features. The area of land in Leupp set aside for industrial purposes contains 145 acres and is roughly rectangular in shape. See Figure 10. East and west boundaries are parallel and oriented in a north-south direction. They are 2,240 feet and 3,240 feet long respectively.

The northern boundary of the site is identical with the rightsof-way line for Navajo Route 15 and is generally oriented in a ENE and WSW direction. This boundary line is 2,560 feetlong.

On the south side of the site boundary follows the rights-of-way line of the 30" OD Transwestern Natural Gas pipeline and is generally oriented in an east-west direction.

The Leupp Airport, two bladed strips forming a "T", divides the industrial site into three parcels, but as the blading is shallow only a visual division exists; the physical barriers caused by the airport are insignificant.

Prevailing winds are from the southwest. On the eastside three acres of the park site are used for a sanitary land fill but since this particular area is cut by gullies along the bank of the Canvon Diablo Wash no developable land is lost.

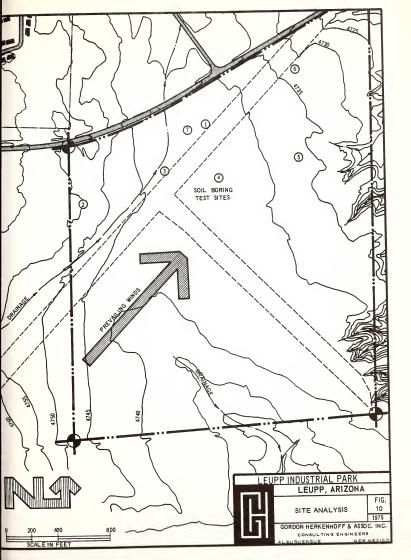
The nearest developments, the Chapter House complex, is more than 600 feet from the site's western boundary. Moreover, the complex is administrative and commercial in nature and is a natural buffer to the park site if such be needed.

As regards land use conflicts only two came to mind: (a) The site is used for the landing strips and industrial park development may require either abandoument or reorientation of these strips. (In this context it should be noted that the approach zone to the main runway crosses and conflicts with Navajo Route 15 and the runways should be reoriented for this reason alone.)
(b) With the development of the industrial park some grazing land will be lost.

 Topography. While the average elevation of the site is approximately 4740 feet above medium sea level (AMSL) and the land appears reasonably level, the flatness is a deception caused by the size of the area, the gentle grades and the total absence of reference features.

The lowest elevations on the site are along the eastern boundary where the gullies down to Canyon Diablo Wash can be found. Elevations may be as low as 4,715 feet in these gullies but only 2% of the site is affected. The rest of the site has elevations from 4,730 to 4,755 feet with a large, flat area in the middle between elevations of 4,740 and 4,745 feet. The average slope is around 1% and ranges from 0.0% to 2%.

3. <u>Drainage</u>. A minor (very minor) drainage swale enters the site from the west and traverses the NW corner of the site north of the main landing strip. On occasion, during severe thunder showers, the water from this swale enters the landing strip itself



but damage has always been slight if not negligable. A broad and gentle swale in the south portion of the site drains to the Canyon Diablo Wash across the Transwestern pipeline scar. No culvert appears necessary as there is never much water and little soil erosion occurs. In general the site is well drained and runoff is rapid. No ponding occurs.

4. <u>Vegetation & Wildlife</u>. Shadscale, alkali sacaton, annual weeds, mesquite, and sage are predominant and none exceed 3 feet in height. There are no trees and only snakes, lizards, rabbits and insects inhabit the area. Some coyotes scavenge in the sanitary landfill site on the eastside of the site and some of the site is used for grazing horses.

## 5. Soils Investigation.

- a. Surface soils and shallow sub-surface rock formations are uniform throughout the park site. Surface soils can be described as a clay loam, a shallow, medium textured, weakly developed slowly permeable saline-alkaline soil with bedrocks outcrops or exposed sandstone and shales. Bedrock outcrop areas are too numerous for individual identification and more than 15% of the surface area covered. The shape of the soil is irregular and mixed and soil depth does not exceed 20 inches.
- b. Sub-surface soils were investigated by Albuquerque Testing Laboratory, Inc. during the week of December 4, 1974. Location

and elevation surveying of the test hole sites were done by a team from Gordon Herkenhoff & Associates, Inc.

Because of the apparent uniformity of sub-surface conditions indicated by initial drilling, by rock out-croppings throughout the site and by the layers of sandstone visible in a 15 foot vertical face by the Canyon Diablo Wash, drilling was confined to the northern half of the park site where it appears most natural to begin industrial park development.

With reference to Figure 10 , these holes were drilled:

## AREA

#1 1 hole 42 deep, ground elevation 4,742.25 #2 1 hole 4' deep, ground elevation 4,753,39 #3 1 hole 10' deep, ground elevation 4,741.49 1 hole 5' deep, ground elevation 4,743.67 #4 #5 1 hole 21 deep, ground elevation 4,737.16 #6 3 hole 18" deep, ground elevation 4,732.58 12" deep, 6" deep. #7 1 hole 5' deep, ground elevation 4.740.53

Test holes in areas one through five were actually drilled after the test holes in area no. 6 and no. 7, which were only exploratory. The report from Albuquerque Testing Laboratory, Inc. for holes #1 - #5 can be found in Appendix 2 of this report.

The surface geology of the site in the area where holes were drilled appears uniform with refusal to auger drilling reached sooner at lower elevations than at the higher ones. This indicates a stratified sub-surface structure with the various layers extending throughout the tested area. Surface and sub-surface soils and/or rock encountered at the test locations are reddish-brown to brownish-red, sedimentary deposits of interbedded clayey shales, silty, fine sands and silty, fine grained sandstone.

The soils and/or rock are generally in a <u>dense</u> to <u>very dense</u> state of relative density. Refusal to auger drilling with the equipment used was met in four of five test borings at the relatively shallow depths of 2.5 feet to 5.0 feet.

Atterberg Limit tests made on the minus 40 mesh material of the clayey shales and/or sandstones show that the fines of these sedimentary rocks are of medium plasticity and existing field moisture is generally below the plastic limit; therefore, with increased moisture content the shales can be expected to swell to some extent.

The laboratory report in Appendix 2 goes on to recommend specific procedures for building foundations and concludes:

"It will be important to <u>provide</u> and <u>maintain</u> positive surface water drainage around and away from exterior walls and to keep soils at and below foundation depths from becoming wetted

or saturated to various degrees. Some of the foundation soils of the type found at this site will swell if they become moistened or saturated to various degrees with possible resulting structure heave. To help protect foundation soils at and below foundation levels from moisture intrusions we recommend the following:

- (a) Keep opened excavations for foundations "dry" and place concrete as soon as practicable after excavations are opened.
- (b) Provide and maintain positive surface water drainage around and away from the structures.
- (c) Properly compact all soils around exterior walls, foundations and in utility trenches to a minimum of 90% of Modified Proctor Density.
- (d) Discourage planting of flowers or shrubbery adjacent to exterior walls unless subsurface drainage is provided for planters or planted areas.
- 6. <u>Industrial Site Data</u>. From the preceding description of the industrial site plus information regarding the existing land use and developments in Chapter II, all data pertaining to a numerical evaluation of the park site can now be assembled as shown in the following Table 40.
- 7. <u>Numerical Evaluation</u>. The following tabulation of the relative advantages and drawbacks of the Leupp industrial park site is based on an absolute scale of 0-4 for each factor and with weights of importance ranging from 1 to 6. Because utility developments are

#### TABLE 40

## INDUSTRIAL SITE DATA

GENERAL	INFOR	MATION
Eleva	tion	(Average)
Size	(Acre	es)
Shape		

Orientation
Ownership (Availability)
Cost of Acquisition
Land Use Conflicts

PHYSICAL PARAMETERS Topography

Slope
Gullies
Drainage
Loadbearing Capacity
Excavation Problems

ACCESS TO TRANSPORTATION Major Highway Paved Road Railroad

Airport
UTILITIES, DISTANCE TO
Water

water Electricity Gas Sewer Solid Waste Disposal

UTILITIES, LINE SIZES
Water
Electricity
Gas
Sewer

Solid Waste Disposal

4740 feet AMSL
145 Acres
Roughly rectangular
Good location relative to community
Leupp Chapter, Navajo Tribe
None
Bladed air strips in park area

Gently rolling, mostly flat or evenly sloped 0.% - 2.0% None in park area Fair Good, but some expansion soils Severe - 60% blast & drill

20 miles (I-40) Adjacent 20 miles (A.T. & S.F.) Landing strip on site, Air carrier, 25 miles

400 feet 400 feet 2000 feet Sewer on site Adjacent to park site

2 inch diameter 3 phase 21 KV 4 inch diameter 10 inch diameter 3 acres, Sanitary Landfill costly, proximity to and adequacy of utilities have been assigned a relative weight of forty (40) points on the basis of one hundred (100) total points. The remaining three groups of factors, site characteristics, surface conditions and distances to transportation facilities were assigned weights of twenty (20) points each because with respect to the Leupp industrial site, deficiencies in these factors would be relatively less expensive to rectify. Within each group the factors which would lead to approximately equal development costs and the factors which would lead to extensive delays of development were assigned as nearly equal weights as possible. For example, distance to the nearest paved road received a relative weight of six (6) points as did distance to the nearest water main although these factors belong in separate groups.

Consistency exists, therefore, internally in each group as well as across the total set of factors.

The "absolute scale" limits itself to Leupp's competitive arena the measurements pertain to a maximum efficiency, land-locked industrial park for labor intensive industrial processes with low input and marketing sensitivities as regards distance and transportation costs.

A site satisfying all criteria for such an industry would score 400 points and when fully developed to satisfy tenant requirements would be the "ideal" industrial location for its tenants. A site satisfying few or none of these criteria would score close to zero. A site not too far from roads, highways and utilities and with good surface conditions and definitely useable as an industrial park, would score around 250 points.

For the Leupp industrial site:

TABLE 41 A

INDUSTRIAL SITE CHARACTERISTICS: GENERAL INFORMATION

FACTORS	SCALE RATING	WEIGHT	SCORE
Shape	4	2	8
Orientation	4	1	4
Size	4	2	8
Availability	4	5	20
Cost of Acquisition	4	6	24
Land Use Conflicts	2	4	8
TOTALS		20	72

Maximum Attainable:  $4 \times 20 = 80$ 

TABLE 41B

INDUSTRIAL SITE CHARACTERISTICS: PHYSICAL PARAMETERS

FACOTR	SCALE RATING	WEIGHT	SCORE
General Topography	3	4	12
Slope	3	2	6
Gullies	4	2	8
Drainage	2	3	6
Loadbearing Capacity	3	3	9
Excavation Problems	2	6	12
TOTALS		20	53

Maximum Attainable:  $4 \times 20 = 80$ 

TALBE 41C

INDUSTRIAL SITE CHARACTERISTICS: DISTANCES TO TRANSPORTATION FACILITIES

FACTOR	SCALE RATING	WEIGHT	SCORE
Major Highway	1	4	4
Paved Road	4	6	24
Railroad	1	2	2
Airport (Basic Utility)	3	5	15
Airport (Air Carrier)	1	3	3
TOTALS		20	48

Maximum Attainable:  $4 \times 20 = 80$ 

TABLE 41D
SITE CHARACTERISTICS: DISTANCES TO UTILITIES

FACTOR	DISTANCE	SCALE RATING	WEIGHT	SCORE
Water	400 ft.	3	4	12
Electricity	400 ft.	3	5	15
Gas	2000 ft.	1	5	5
Sewer	0.0 ft.	4	4	16
Solid Waste	0.0 ft.	4	2	8
TOTALS			20	56

Maximum Attainable:  $4 \times 20 = 80$ .

TABLE 41E

SITE CHARACTERISTICS: ADEQUATE UTILITY CAPACITIES

FACTOR	CAPACITY	SCALE RATING	WEIGHT	SCORE
Water	2" pipe	0	3	0
Electricity	3 phase 21 KV	3	6	18
Gas	4" pipe	2	6	12
Sewer	10" pipe	2	3	6
Solid Waste	3 acres	2	2	4
TOTALS			20	40

Maximum Attainable:  $4 \times 20 = 80$ 

TABLE 41F
RELATIVE MERITS AND DEFICIENCIES OF THE LEUPP INDUSTRIAL SITE

FACTOR	SCORE	MAXIMUM POSSIBLE	PERCENT
General Characteristics	72	80	90%
Physical Parameters	53	80	66%
Distances to Transportation	48	80	60%
Distances to Utilities	56	80	70%
Adequacy of Utilities	40	80	50%
TOTALS	269	400	67%

8. <u>CONCLUSION</u>: A score of 67% for an undeveloped parcel of land is not insignificant relative to a 100% score for the ideal industrial park. With development, the Leupp industrial park can definitely become one of the more attractive locations in the Southwest.

By bringing utilities into the site, the Leupp industrial park would raise its relative evaluation to 73% of the ideal. Further, if all utilities are sized to satisfy any prospective tenant with some industrial water and fire flow the score would increase to 83%. If a general aviation airport is built in the park, with capacity to handle minor transports the score would rise to 87% of the maximum attainable.

If sufficient capital is invested in drainage, internal utilities, building foundations, internal streets and in airstrip relocation to achieve an optimum parcel mix, then the park would rate 94% of the ideal.

In other words, development of the park can definitely make Leupp a marketable industrial location.

The following chapter explores various alternatives for the development of the proposed Leupp Industrial Park, their relative merits and costs.

CHAPTER VIII
INDUSTRIAL PARK MASTER PLAN



#### A TATRODUCTION

At issue in the site design process is the efficient and thus, economical, utilization of the land, available natural resources and existing support services.

Criteria for site design include:

- Size of the site with respect to future expansion and divisibility into workable lots.
- Shape of the site, its implications for efficiency of lot shapes and internal transportation and utility design.
- 3. Orientation of the site toward external transportation facilities.
- Compatibility between site features and adjacent as well as community land uses.
- 5. Topography as it pertains to internal design.
- Area topography as it pertains to runoff and drainage structures in and around the park,
- 7. Availability of distance to and adequacy of existing utilities.
- 8. Economy of site development.

Since we only know that Hewlett Packard Co. may need a five (5) acre rectangular lot, parcel sizes for future companies are unknown, and the over-riding principle in the Leupp park design becomes the need for flexibility.

Within the constraints of setbacks, parking areas, loading area requirements, streets and utilities, the design must allow for a wide variety

of lot sizes so that future firms can locate in the park without modification of initial developments. The predominance of one-story plant layouts and the Navajo desire for labor intensive industries make fairly large lot sizes a prerequisite in this particular case. Commitment to a small-meshed road and utility grid is therefore the wrong approach since the overall flexibility will be lost.

Average size of individual lots has been envisioned as around two (2) acres with a good number of both larger and smaller lots. Phase I commitment in roads and utilities does not freeze this pattern, however, as these facilities are brought to central locations from where they can be distributed in any direction to any size lot as required.

The shape of a site determines whether the internal organization is linear, radial or some combination of the two. Roadways, utility, easements and the divisibility of the site into development phases and lots for specific industrial users are, therefore, affected by the site's shape and one system of organization may be more economical than another. Individual lots, roughly rectilinear in shape, with an approximate ratio of width to depth of 1.5:2.0, are recommended for the Leupp industrial park.

Roadways, air fields and drainage ways are major determinants of organization within a site. Internal roads should provide clear and direct access to major exterior roads and vehicular movement through the site should be unhampered by heavy traffic or by parked

cars and trucks. Recommended roadway width is 40 feet with a 30 foot right-of-way on both sides and since large trucks need a 60 foot turning radius, the proposed park design incorporates this requirement.

Successful industrial development in Leupp would provide numerous jobs for the Navajo and would provide the basis for new residential and commercial development. It is of importance, therefore, that the industrial park not only be internally efficient but that it also can boast of compatibility with the surrounding community.

For this reason the scale of the buildings, the use of materials and the density of the overall site plan should compliment and enhance the appearance of the surrounding area. When this is not entirely possible, 50 foot to 200 foot buffer zones should be used to shield the industrial site. Since any form of development on the Navajo Reservation could be construed as a travesty of the land, compatibility cannot be overemphasized.

Leupp is not an intensely used area, but this fact does not negate the need for concern for compatibility of industrial development with existing land uses. One of the primary reasons for selecting the proposed site was the Navajo desire to conserve grazing land for sheep, and since the air field was located in this area it was considered available for development. An industrial park in any other location in the Leupp vicinity would consume too much valued pasture land. For these reasons other locations in the area were only briefly considered and were rejected as much as on the basis of land use incompatibility as on the basis of topography and development cost.

VIII-3

### B. PARK DESIGN

The final park master plan is, in essence, the optimum solution to the lot size and internal circulation questions within the framework of a number of constraints.

1. As previously noted the site designated for industrial purposes at Leupp encompasses roughly 145 acres of land, all of it developable. All this area will not be needed at one time, however, and it appears reasonable to develop the park in steps.

Dependence on basic utility and roadway requirements and the cost of providing these services, preclude scattered and remote developments throughout the site and set the tone for an orderly and economic phasing of park improvements.

- 2. Development on a nearly level site and parallel to or perpendicular to the contours minimizes drainage problems and reduces the cost of excavation for buildings and road alignment. But there must be adequate slope, parallel to the major axis of development, in order to provide sewage lines without the need for lift stations and other expensive equipment. This further limits plan orientation and the initial design possibilities.
- 3. It was the initial intent to abandon the air strips now located on the industrial site, but other area sites are not as suitable and the Navajo Airport Systems Plan indicates the need for a basic utility airport at Leupp.

From the standpoint of industrial park development the airport would enhance the attractiveness of the Leupp park and should somehow be worked into the park design. Recommendation

No. 1 shows such an alternative.

- 4. Although the industrial park should be developed as an autonomous unit, its role as a generator of community development cannot be overlooked. It is anticipated that simultaneous development of residential areas and necessary support services for the increased population would occur. Thus, included in the costs for industrial development are the costs for developing a water system of sufficient capacity to serve both the industrial park and residential development. Eventually, this water system would be connected with the existing water supply. The other costs of residential development are listed as separate from industrial park costs.
- 5. The proposed industrial park site slopes gently to the northeast and east. Such a slope is favorable to an air field operation,
  site drainage, building and road design. However, there is a
  minor problem obtaining adequate slope for the sewer lines. Fortunately
  careful layout of roads and lots can overcome this deficiency.
- 6. Buried service lines parallel and adjacent to road easements are desirable throughout the park as they permit more flexible utilization of the site. Elevated lines are unattractive and more susceptible to damage and consequent disruption of service.

On the following pages, two alternate schemes are presented to demonstrate possible locations of the air field, the resulting areas suitable for development, and internal organizations of those areas. The advantages and disadvantages of the resulting developments are discussed for each case. In all cases the development areas are divided into lots of roughly the same size and shape. Odd shaped corners of the tract are recommended for parking or storage yards.

The requirements for community infrastructure developments such as residential, commercial, administrative, recreational and transportation facilities remain much the same with all industrial park alternatives.

It is the recommendation of this consultant that a comprehensive community plan be completed for Leupp as soon as possible.

#### C. PROPOSED INDUSTRIAL PARK PLAN

### Specific Design Concepts -

1. The air strips should be realigned as shown in Figure 11 . In its new orientation the major runway roughly parallels Navajo Route 15 and allows for a nearly rectangular industrial park development. Moreover, the air strip thusly realigned seems to satisfy FAA wind coverage requirements even better than the existing orientation and agrees with the Navajo Airport Systems Plan which at this time does not envision the immediate need for a crosswind runway.

2. Due to the existing conflict between the aircraft approach pattern and Navajo Route 15, the new alignment is solving part of this problem by allowing planes to approach in a slightly more westerly direction.

In addition to the realignment, however, the runway length required for a satisfactory basic utility airport necessitates the extension of the main runway another 1.000 feet west-southwestward.

- 3. The western boundary of the existing industrial site is 400 feet from any existing development. Yet a 200 foot broad buffer zone is more than adequate with sufficient shielding. With the air strip relocated westward a 200 foot extension of the industrial park area in the same direction provides a more flexible first phase development and gives taxiway access to an additional 15 acres of industrial park land.
- 4. The minor westward extension of the industrial site conflicts with nothing more than the existing site does, and moreover provides for more effective and inexpensive hook-up to available utilities. The new portion of the park site is also on the highest point of land in the immediate vicinity, and is thus the logical location for initial water storage.
- 5. Finally, with the new site configuration the secondary development (Phase II) can serve a much larger number of lots and connection of industrial site and existing sewers can occur at a point further to the northeast where elevations allow for better gradients. (See Figure 12.)

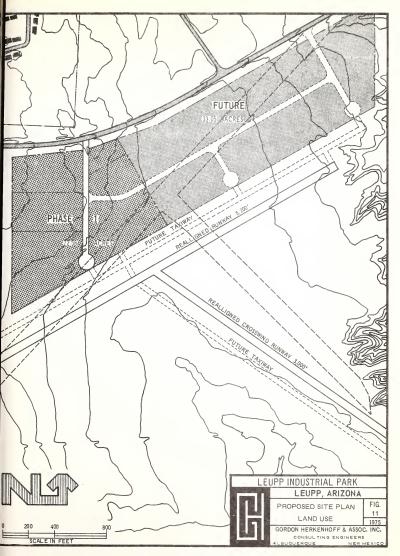
### D. ADVANTAGES

- Realignment of air field permits a linear internal configuration with higher operational efficiency.
- A development parallel to Navajo Route 15 permits a natural extension of utilities and roadways for Phase II.
- Westward extension of site boundary and realignment of the air field minimizes Phase I utility and road costs.
- Phase I developments have increased access to the air field taxiway.
- There will be a generous buffer between air field, residential, future commercial and administrative areas.
- The proposed changes will solve the conflict between runway approach and traffic on Navajo Route 15.
- 7. With the proposed alternatives Leupp will have an <u>airport</u> industrial park rather than just an industrial park.

#### E. DISADVANTAGES

- 1. Cost of main runway relocation.
- F. DEVELOPMENT COSTS, ALTERNATIVE I

Phase I, which with reasonable success should be used to capacity in three years from start of development, should cost



no more than \$813,318. Inflation should be added in the event development occurs after 1975.

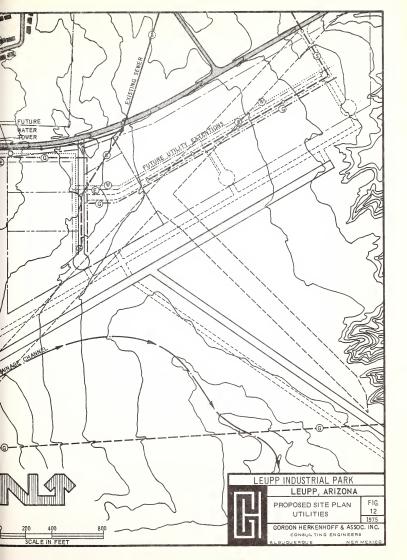
It is envisioned that airport improvements should be limited to a relocation of the dirt strip for Phase I. When demand for airport facilities increase with development of Phase II, a basic utility airport should be built with paved aprons, taxiways and runways.

# 1. Industrial Park Phase I (1 - 3 Years) -

a. Roadway

α.	(1) Curbs & Gutters	8,500
ь.	Site Grading	20,000
с.	Sewer Lines	15,000
d.	Water Supply (Includes Residential)	
	(1) Water Lines & Fire Hydrants (2) Wells (2) (3) Storage	100,000 40,000
	(a) Ground .5 M. Gal. (b) Elevated .1 M.Gal.	115,000 100,000
	(4) Equipment	
	(a) 2 Domestic Boosters (b) 2 Fire Pumps (c) 2 Well Pumps (d) Building (e) Collectors	5,000 60,000 60,000 50,000 32,000
е.	Drainage Controls	6,500
f.	Airport Improvements	167,118
PHA	ASE I ESTIMATED CONSTRUCTION COST	\$813,318

\$ 34,200



## 2. Industrial Park Phase II ( 4 - 10 Years ) -

Α.	Roadway	\$ 121,000
	1. Curbs & Gutters	30,000
В.	Site Grading	27,000
С.	Sewer Lines	27,000
D.	Water Supply	
	1. Water Lines & Fire Hydrants	50,000
	2. Wells (3)	60,000
	3. Equipment	
	(a) # Well Pumps	90,000
Ε.	Airport Improvements	772,800
PHAS	SE II ESTIMATED CONSTRUCTION COST	\$1,177,800

### 3. Community Development -

Α.	100 single family units, estimate for site improvements only: paving,	
	curbs & gutters, grading & sewer	\$325,000
В.	Transportation Improvements - replace Bridge on Rt. 99	144,000
EST	TMATED CONSTRUCTION COST	\$469,000

C. Private capital investment in retail, service and ancillary facility development (\$50,000 to \$80,000)

## G. LEUPP INDUSTRIAL PARK DEVELOPMENT, ALTERNATIVE II - DESIGN PARAMETERS

- 1. In the event the air strips are not re-aligned, the parcel along Navajo Route 15 will be wedge shaped and ill suited for an efficient internal design and an optimum mix of lot sizes.
- 2. Industrial park development must, therefore, take place on the south side of the main runway on 25 acres of relatively flat land

for Phase I. (See Figure 13, Alternative II.)

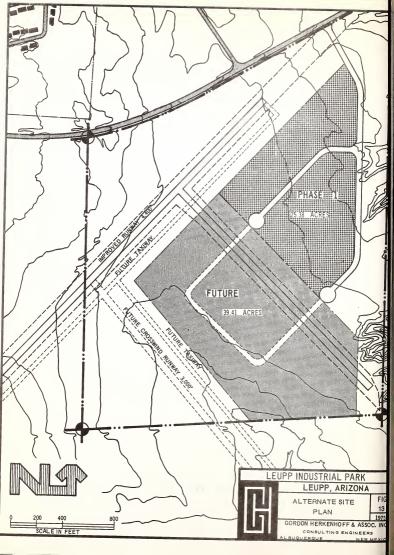
- The major access road to the park from Route 15 would have to skirt the eastern end of the main landing strip and feed two branch roads with cul-de-sacs in the Phase I area.
- 4. Development of Phase II of alternative II would require relocation or abandonment of the crosswind runway. Roads extending from the cul-de-sacs of Phase I would form a semi-circle for flowthrough transportation.
- Utilities can be extended from the NW corner of the site under the landing strip and then follow roadways in the development area.

#### H. ADVANTAGES

- 1. There would be a generous buffer between the industrial park and other area developments. (See Figure 14, Future Land Use.)
- Taxiways for the air strips can be made available for the majority of lots both in Phases I and II.
- To satisfy the Navajo Airport Systems Plan only a runway extension is required.

#### T. DISADVANTAGES

- Access to the industrial park would conflict with the runway approach pattern.



with only one side.

- 3. The access road would, finally, be longer and therefore more costly than if a development was located closer to Navajo Route 15.
- 4. Necessarily, the longer distances of utility trunk lines would lead to increased costs.
- Since there would be only one entrance to the industrial area, deadline demand could lead to congestion during traffic peaks.

# J. DEVELOPMENT COSTS, ALTERNATIVE II

## 1. Phase I

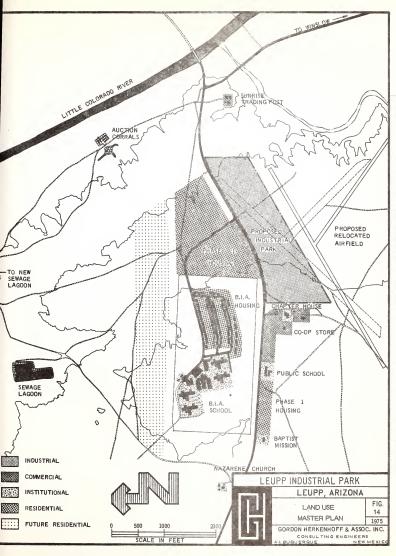
Α.	Roadway (1) Curbs & Gutters	\$ 136,800 34,000
В.	Site Grading	35,000
С.	Sewer Lines	34,000
D.	Water Supply (Includes residential) (1) Water lines and 8 fire hydrants (2) Wells (3) (3) Storage (a) Ground (b) Elevated (4) Equipment (a) 2 Domestic Boosters (b) 2 Fire Pumps (c) 3 Well Pumps (d) Building (e) Collectors	130,000 60,000 115,000 100,000 5,000 60,000 90,000 50,000 32,000
Е.	Drainage Controls	6,500
F.	Airport Improvements	167,118
EST	IMATED CONSTRUCTION COST	\$ 1,055,418

# 2. Phase II

Α.	Roadway (1) Curb & Gutters	\$	90,000 22,000
В.	Site Grading		35,000
С.	Sewer Lines		22,000
D.	Water Supply (1) Water Lines & 5 Fire Hydrants (2) Wells (2) (3) Equipment (a) 2 Well Pumps		35,500 40,000 60,000
Ε.	Airport Improvements		772,800
EST	IMATED CONSTRUCTION COST	\$ 1 <b>,</b>	077,300

# K. COST COMPARISON

	Alternative I	Alternative II
Phase I, Park Facilities Phase I, Airport Improvements Sub-Total, Phase I Phase II, Park Facilities Phase II, Airport Improvements Sub-Total Phase II Total Park Related Costs	\$ 646,200 167,118 \$ 813,318 405,000 772,800 \$1,177,800 \$1,991,118	\$ 888,300 \[ \frac{167,118}{055,418} \] \[ \frac{304,500}{772,800} \] \[ \frac{1}{3077,300} \] \[ \frac{2}{32,132,718} \]
Community Related Costs Private enterprise capital investment	\$ 469,000 (\$ 50,000 to \$ 80,000)	\$ 469,000 (\$ 50,000 to \$ 80,000)





CHAPTER IX

IMPACTS & FEASIBILITY



#### A. THE ENERGY CRISTS AND THE LEUPP INDUSTRIAL PARK

As all industries in the country, industrial firms locating at Leupp will undoubtedly be affected to some degree by the current energy shortage and its indeterminant solution.

On one hand, the relatively long distances to some raw material sources and most markets may lower the attractiveness of Leupp as an industrial location through increased shipping costs caused by rising fuel prices. On the other hand, all industries will experience some of the same effects no matter where they are located. Since the major input factor sought for at Leupp is labor power, a Leupp located firm may find that the relative magnitude of its transportation costs is only insignificantly affected by the energy crisis. Also, with reference to Chapter V, Regional Location Parameters, Leupp is excellently well situated for some industries with almost equal distances to major midwest and west coast markets. From this standpoint, the energy crisis may actually induce a firm to locate at Leupp in order to minimize product shipment costs to these particular markets.

Finally, the availability of labor may be influenced to some degree; given the scattered settlement pattern of the Navajo Reservation and home-to-work distances of 40 miles or more, increases in commuting costs could deter some available labor or could lead to demands for additional compensation.

On the whole, these effects should be minor and in some cases may offset one another. The energy crisis by itself is not expected to effect the success of the Leupp Industrial Park to a degree where a feasibility decision should be changed.

#### B. ENVIRONMENTAL EFFECTS

An outline for environmental assessments has been established by the  $\mathtt{EPA}^1$  and is followed here in its general form.

### Section I - Description of Proposed Action.

Chapter VIII describes the proposed industrial park in detail.

Development of the park implies only earth moving and trenching and hence disturbance of the top soil.

Curbs, gutters, fire hydrants, a water tower and a pump house will be the only initial visible features. The proposed action is in conformance with Tribal, local and Federal Plans.

## Section II - Environmental Impact of the Proposed Action.

# A. Existing Environmental Conditions.

These are described in Chapter III and include: Climatic, geologic, hydrologic, zoologic, botanical elements, archaeological and historical sites (of which there are none), buildings, roads, the needs of the project area,

<sup>&</sup>lt;sup>1</sup>CG-99A (Rev. 11-7-73).

utilities and present socio-economic characteristics.

- B.  $\frac{\text{Environmental Conditions should the Proposed Action be}}{\text{Implemented.}}$ 
  - 1. Short term construction impact. Phase I will require no more than 35 acres including the new air strip. Only a portion of this area will be affected by construction of roads and utilities which will disturb some top soil and will inevitably cause dust and noise pollution during the construction period. Prevailing winds from the southwest will, however, tend to carry both dust and noise onto open land to the northeast of Leupp. Nearest human activity lies 400 ft. west of Phase II.

No erosion is foreseen and no water courses will be altered or affected by sedimentation or siltation. Traffic on nearby roads will be temporarily disrupted by utility trenches but adequate bypasses should be easy to provide.

 Long Term Impact. Small areas of grazing land will be used but since the vegetation is so sparce 30-40 acres are required per head of cattle and the economic impact of Phase I is therefore minimal.

Development of the park site will not disrupt any natural views; a low profile is recommended for all buildings and adequate landscaping should be made a requirement to minimize visual impact. Sewage treatment will be adequate to protect existing water qualities and no odor problems are foreseen and the proposed action will enhance the local water supply.

Logs of existing wells indicate no ground water depletion problem. Some dikes and minor drainage channels may have to be constructed and may disturb 2 or 3 acres of top soil but water diversion is minimal.

## 3. Secondary impacts of the Proposed action.

- a. Effects on residential and industrial development. The proposed action may <u>cause the development</u> of industry and residential areas. Existing settled areas may be filled in and better services provided.
- b. The character of the area may change drastically if the industrial park is successful. Whereas Leupp now is educationally oriented with only churches, trading posts, a chapter house and a food warehouse to complement the basic activity, industrialization may shift the weight of local activity to production and industrial employment, secondary commercial enterprises and perhaps public administration and health services.
- c. The type of growth which may be generated by the proposed action is definitely agreeable to area residents and the proposed industrial park and its design concepts could form the basis for an excellent future land use plan for Leupp.

### Section III - Adverse Impacts which cannot be Avoided.

Temporary construction noise, some disruption of traffic, some disturbance of top soil (grazing land) and minor removal of wildlife and insect habitats. Until buildings appear on the site, the visual effects will be minimal.

## Section IV - Alternatives.

- 1. Not to develop the site means that the pastoral economy of Leupp may remain unchanged for some time. The industrial site already contains the two air strips covering ca. 20 acres where the top soil is already disturbed. Not to developing Phase I of the proposed action would only save 25 acres of sparse grass and brush. The lost economic potential to Leupp, however, is considerable.
- Alternative Plan, Phase I, would have the same impacts as Proposed Plan, Phase I.

## Section V - Local Short Term Uses vs. Long Term Productivity.

In as much as the park facilities only eliminate minor grazing acreage from current use and the major portion of the site is committed to transportation (air strips), very little local, short term use is disturbed. On the other hand, if the industrial park on the land in question can provide opportunities for training, employment and income for up to 600 local Navajos then the long term productivity is certainly enhanced.

### Section VI - Irreversible and Irretrievable Resources.

Such resources include only the raw materials used for industrial park facilities and buildings. The capital and input of human labor can be liquidated and retrieved as can the land by razing all structures and let the scars in the vegetation heal themselves.

## C. PRELIMINARY ESTIMATE OF ECONOMIC IMPACT

Quite obviously, one cannot project anticipated employment at the Leupp industrial park in the same manner as one projects employment for the Nation, for a state or even for a medium sized town.

The reasons are quite simple:

- Leupp has no industrial employment to speak of to use as baseline data.
- 2. Leupp has no employment trend.
- Leupp has mostly educational activity based on the area's indigenous population whose labor force is mostly unemployed.
- 4. The uncertainties connected with locating a firm at Leupp undermine the notions of a set time schedule of development or an employment projection by year.

One can therefore only proceed according to assumptions:

1. If the Leupp industrial park is developed, Hewlett Packard

may move into it and perhps employ 100 to 150 persons in five years.

- If the park is developed the Tribe's industrial development staff will have a much improved industrial location to promote.
- If promotion efforts are successful one or more firms may settle at Leupp over the years.
- If these firms locate labor intensive processes at Leupp,
   the employment impacts may be considerable, but with unknown magnitude.
- If labor demand is big enough, the Leupp area may not be able to furnish a sufficiently large, trainable labor pool.
- If adequate community developments are provided, Navajos from somewhere else on the Reservation may relocate to Leupp and supplement the labor pool.
- 7. If community services and facilities are not provided the supplemental labor force may not appear and employment at Leupp will stabilize at a lower level.

But even if everything goes well and all factors combine to suggest
a maximum development at Leupp with housing, schools, parks and
commercial areas, extraneous events (economic fluctuations, political
conditions) may still cause the industrial park to stand vacant or with only
one or two minor employers. There is also the opposite possibility
that a large national enterprise may locate a sizeable assembly or
manufacturing operation in the park with employment of several thousands
of persons.

DX-7

With these extremes and unknowns in mind a moderate but still optimistic approach has been used when phasing the park developments and projecting anticpated employment.

Since it takes time to implement physical facilities plans, it is reasonable to hope that when Phase I of the proposed park alternative is developed late in 1976, the park can be occupied immediately by a tenant employing around 150 persons. This group can be drawn from the Leupp area, but employment beyond this number may require additional housing and utilities.

If such facilities are finished in 1977, and another employer moves in, the park may conceivably sustain a labor force of 300 in 1978 and 1979.

Phase I water system (except the ground storage) is sized for this number and the corresponding water consumption. The years 1977, 1978 and 1979 are considered the Phase I period after which additional developments should be made as outlined in Phase II.

Phase II could be developed at any time if a sufficient number of firms want to locate at Leupp. But with community infrastructure developments to consider and lead times for planning and training of employees, it would be optimistic to hope that Phases I and II might be filled to capacity sooner than 1984, eight years after completion of Phase I. For this reason, fire flow capacity of the water system has been designed for 1,000 employees maximum.

Realistically, however, one should not expect that the Leupp Industrial Park and community support facilities will sustain more than 600 employees by 1984, with a 60% saturation of the park.

As Leupp matures as an industrial location additional expansion of employment can be expected throughout the 1980's.

Table 42 on the following page shows direct wage impacts, income from building leases and costs relating to training, park development and building amortization.

The Tribe may receive benefits in the form of direct employee wages, on the job training subsidy (50% of wage for 2 years), subsidized pre-job training of employees and park development grants. The Tribe may or may not get grants for industrial buildings and normally these are provided and liquidated by the Tribe itself.

- a. With an annual average salary of \$7,500, OJT costs amount to \$3,750 per employee for at least two years (the tendency is to move the employee to a different or more advanced job after one year and continue to train him.
- b. Pre-job training for six weeks may be as high as \$1,500 per trainee, but \$1,000 seems a more reasonable average.
- c. Assembly plants with a warehouse, a cafertia and office space may require 175 feet per employee. At a cost of \$22.00 per square foot, a plant with 150 employees would cost \$557,500. Estimated annual debt service would be \$86,000 over a 10 year period, but during the first year or so with high outstanding balances, costs would be \$115,000

TABLE 42

BENEFITS AND COSTS, LEUPP INDUSTRIAL PARK PHASE I

			BUILDING INCOME	TOTAL	COST	PRE JOB TRAINING	SITE DEVELOPMENT	BUILDING	TOTAL
YEAR	EMPLOYEES	WAGES	so-	S	S	S	\$5-	\$5-	S
1975							25,000		25,000
1976						150,000	813,318	115,000	1,078,318
1977	150	1,125,000	86,000	1,211,000	562,500	150,000		109,300	821,800
1978	150	1,125,000	86,000	1,211,000	562,500 150,000	150,000		103,600	816,100
1979	300	2,250,000	86,000	2,336,000	562,500	150,000		97,900	810,400
1980	300	2,250,000	86,000	2,336,000	562,500			92,200	654,700
1981	300	2,250,000	86,000	2,336,000				86,500	86,500
1982	300	2,250,000	86,000	2,336,000				80,800	80,800
1983	300	2,250,000	86,000	2,336,000				75,100	75,100
1984	300	2,250,000	86,000	2,336,000				005,69	005,69
1985	300	2,250,000	86,000	2,336,000				63,700	63,700
1986	300	2,250,000	86,000	2,336,000				58,000	58,000
	TOTAL CURRENT VALUE BENEFITS:	VALUE BENEFI	TS:	21,099,000		TOTAL CU	TOTAL CURRENT VALUE COSTS:	STS:	4,639,818

and declining by about \$5,700 per year. (The firm's lease payments would be around \$86,000 per year, however.)

#### D. FEASIBILITY

Since the Federal Government is involved with funds through the EDA, the BIA, the Department of Labor and other departments and agencies; the Navajo tribe is involved with their department of Program development and the Navajo Tribal Housing and Utility Authorities, and the only private entitites involved are the Navajo employees and the tenant firm - the problem of feasibility becomes clouded by unsolved questions regarding tabulation of costs and benefits and to whom they accrue.

- To the tenant firm the proposition is a good one with half of the payroll subsidized by Federal and Tribal training programs.
- To the unemployed Navajo the job opportunity means the difference between a wage and a welfare payment.
- 3. To the Tribe the entire enterprise is beneficial because technical aid, industrial park development and, to some degree, housing, utilities and other community amenities may be funded by the Nation at large.

It is the opinion of this report, however, that in the context of infrastructure investment in a socio-economic system, it is regarded as most important that monetary benefits to the Tribe and the individual Navajo employee be treated as a true social benefit to our entire system. The same reasoning applies to the tabulation of total social and economic costs when including both direct facilities development costs and governmental and tribal subsidies for training and community amenities. Once this frame of reference is established, however, the mathematics of the cost-benefit method can be applied with results as follows:

# 

a. For 1975 - 1980 (Four years of operations)

Benefits \$7,094,000 Costs \$4,206,318 Net Benefits \$2,887,682

Ratio - 1.69

b. For 1975-- 1986 (10 years of operation)

Benefits \$21,099,000 Costs \$4,639,818 Net Benefits \$16,459,182

Ratio: 4.5

### Case #2. Discounting Cost and Benefits at 10% per year cumulatively to present value:

a. 1975 - 1980 (4 years of operation)

 Present value of benefits
 \$4,956,000

 Present value of Costs
 \$3,232,577

 Present value of Net Benefits
 \$1,723,423

Ratio: 1.5

b. 1975 - 1986 (10 years of operation)

 Present Value of Benefits
 \$11,275,000

 Present Value of Costs
 \$ 3,432,219

 Present Value of Net Benefits
 \$ 7,842,781

Ratio: 3.3

### Case #3. Internal Rate of Return:

The benefit and cost series yield an internal rate of return higher than 20% both for the 1975 to 1980 and 1975 to 1986 periods.

As final influensive factors one might consider the benefits by labor's share of value added in manufacturer in excess of wages plus savings in the form of reduced welfare payments to unemployed Navajos.

Provided the development of Phase I of the Leupp Industrial Park is supported by general community development and provided that the industrial recruitment effort can bring in 300 jobs to Leupp by 1980, then, from the standpoint of a socio-economic infrastructure investment, the Leupp Industrial Park is eminently feasible.



CHAPTER X

IMPLEMENTATION & ASSISTANCE



#### A. INTRODUCTION

The major factors contributing to the success of any industrial and economic development program are knowledge, preparation and continuity. Before any development effort is initiated, the community should have gathered the kinds of information that business or industry will be interested in having available when making an investment decision. After gathering information, there should be an objective analysis of data to determine community weaknesses and strenghts.

A truly objective analysis will lead to the establishment of realistic development goals and objectives and provide future direction for the industrial program. Preparation for industrial development involves taking steps to remedy community weaknesses as well as providing a local organization to carry out the development program. It is essential that an objective analysis of community assets and liabilities be followed by a carefully conceived program to remedy deficiencies and enhance strengths before any promotion or prospecting is undertaken. As a rule, plant location decisions are not made in haste, and many years may elapse between the time a prospect is first contacted, an initial interest is expressed as a firm commitment is made by a prospect to locate in a community. For this reason, it is important to maintain organizational continuity in an industrial development effort.

with this in mind, it will be understood that it may take time to bring an industrial development program for Leupp into full operation and perhaps an even longer time to realize any success in terms of developing prospects or locating an industry there. During this time, it is essential to have continuity to effort and one person in the development organization should always have Leupp as his priority assignment.

To the extent possible, a professional industrial development program must be insulated from politics. The program staff should not be selected on the basis of political affiliation nor should tenure be determined by the change in local government. If a prospect feels that the people he is working with are in the development program for political reasons, he may not have confidence in promises made by the individuals running the program nor in the representations made by the organization when attempts are made to make him locate in a specific area. Conversely, plant location decisions made soley on the basis of politics may not be in the long-run interests of the Tribe.

#### B. FACTS

When looking for a new site for a plant there is nothing an industrialist wants more than facts which may bear upon his decision. Honesty about a locations attributes as well as weaknesses is of central importance to any industrial development program. All too often, if the developer has

not been honest, the firm locates on a site under false impressions and soon becomes disenchanted and leaves. With such a mark on its development history, a community may never again land another firm.

On the other hand, detailed knowledge about the prospect is equally important to insure that if a firm finally settles on a site the local community receives continuous and long range benefit. Otherwise a firm may come in under false pretenses to take advantage of specific, potentially short term conditions and leave when such conditions change. However, before a prospect will show much interest in a location at all, at least the following information must be available to him:

# PROPOSED INFORMATION FILE CONTENTS FOR LEUPP

- 1. Size and Character of the development community.
  - a. Strategic and Economic Location
  - b. Population and Territory
    - (1) Area limits
    - (2) Distances to other towns
  - c. Population and Economic Growth
  - d. Form of Government
    - (1) Names and Titles of Administrative and Elective Officials
  - e. Community's Regional Orientation
- Present Industrial Development Characteristics
  - a. Summary of Industrial Development History
    - Number and Character of Present Manufacturing Establishments
      - (1) Employment
      - (2) Expansion History

- c. Local Attitude Toward Industry
- d. Available Industrial Site Inventory
- e. Types of Industry Desired for Economic Balance

# 3. Markets - Local and Regional

- a. Population Analysis
  - (1) Income levels
  - (2) Age groupings
  - (3) Educational Levels
  - (4) Occupational Breakdowns

#### b. Trade Area Characteristics

- (1) Communities within 25 miles
- (2) Employment Characteristics
- c. Proximity to Major Market Areas

#### 4. Labor Force Characteristics

- a. Available Labor Supply
  - (1) Total labor force (male and female)
  - (2) Employed labor force (male and female)
  - (3) Unemployed labor force (male and female)
  - (4) Skilled and unskilled labor (male and female)
  - (5) Prevailing Wage Rates
- b. Community Labor Relations History
  - (1) Organized labor activity
  - (2) Community Work Stoppage History

#### 5. Transportation

- a. Truck service and facilities
- b. Rail service and facilities
- c. Air service and facilities
- d. Highways

#### 6. Utility Services and Fuel Sources

- a. Electric Service
  - (1) Capcity and Availability
  - (2) Rates and charges

#### b. Natural Gas

- (1) Capacity and availability
- (2) Rates and charges
- c. Coal
- d. Fuel oil

# 7. Water Supply and Waste Disposal

- a. Water supply
  - (1) Sources and availability
  - (2) Rates and charges
  - (3) Chemical analysis
  - (4) Ground and surface water sources and supply

# b. Waste Disposal

- (1) Sewerage treatment facilities and capacity
- (2) Rates and charges
- (3) Waste disposal regulations (Sanitary Codes, Air Pollution Regulations, etc.)

#### 8. Natural Resources

- a. Mineral resources
- b. Forest product resources
- c. Agricultural resources

#### 9. Real Estate Characteristics

- a. Present values of commercial and industrial property
- b. Planning and zoning information
- Property and ownership maps of industrial and commercial areas
- d. Large commercial and industrial buildings available

### 10. Housing

- a. Single family residences, rental vs. non-rental
- b. Multiple family residences
- . Local residential construction industry characteristics

### 11. Community facilities

a. Educational facilities

- (1) Public school system
- (2) Parochial and private schools
- (3) Colleges and Universities
- b. Public transportation system
- c. Fire and police protection
- d. Hotel, Motels and Public Meeting Facilities
- e. Churches and hospitals
- f. Recreational and cultural facilities

### 12. Financial Resources

- a. Commercial bank resources, is any
- b. Savings and Loan resources, if any
- Industrial financing programs (Federal & Tribe)

# 13. Local Legislation and Regulations Affecting Business & Industry

- a. Taxes and Tax Policies (Particularly important for Leupp.)
  - (1) Property tax assessment practices and Tax Rates by Districts
  - (2) Other business taxes and fees
- b. Building and other codes
- Other business texes and regulations if any

#### 14. Climate and Topography

- a. Geographic and Topographic Characteristics
- b. Weather and Climate

#### 15. Business Statistics for Cumulative Records

- a. Employment figures by industry groups
- b. Number of business establishments
- c. Volume of retail sales
- d. Bank clearings
- e. Postal receipts
- f. Building permits and construction activity
- g. Crop Reports
- h. Population estimates
- i. Assessed valuation
- j. Public school enrollment

### 16. Maps

- a. General geographic location maps
- b. City map
- c. Industrial sites

- d. Highway and Railroad maps
- e. Water and sanitary sewer system maps
- f. Natural gas and electric distribution system maps

# 17. Reports, surveys and official publications

- a. Community master plan and/or economic base study
- Transportation study or state highway department major street and highway development plan
- c. Municipal water, sanitary sewer and/or drainage plans
- Reports or master plans for public school capital improvements programs
- Master plan or Capital Improvement Study for community service facilities (hospitals, convention centers, Museums, etc.)
- f. Conservation and soil district studies

### 18. State and Federal Development Assistance Programs

- a. Bureau of Indian Affairs
- b. Health, Education & Welfare
- c. Offices of Economic Opportunity
- d. Housing and Home Finance Administration
- e. Federal Housing Administration
- f. Rural Area Development
- g. Urban Renewal Programs
- h. Indian Economics and Industrial Aid Programs
- i. Special Federal Programs for the Navajo
- i. Job training and education programs

## 19. Comparative Site Statistics

- a. Comparative wage rates
- b. Lease advantages
- c. Tax advantages (compared to other locations)

It is hoped that the compilation of statistics regarding Leupp contained in this report will contribute some of the required data. However, a review of the available material on Leupp shows that many data items are either not available, are inaccurate or are in conflict with other sources.

Compilation of baseline data is a must for both promotion and implementation and no success will be achieved at Leupp unless a first rate industrial park is built in difference to all the necessary

information about the area. Such information should be ordered and assembled in a Leupp fact Book for distribution to potential industries. Data contained in the Fact Book must be current and must be presented clearly and comprehensively.

Usually it is not necessary to revise the entire fact book at one time. A revision or updating schedule for the fact book should be developed, however, so that information may be kept timely and accurate. Community fact books are often developed by sections in a loose leaf format which permits updating of individual pages as new or more current information becomes available. Normally, the fact book has a limited circulation and is used primarily to respond to inquiries made by prospective firms.

Other types of literature are employed for mass mailing or general dissemination. Less expensive promotional pieces can consist of attractive color brochures; a mini-fact book, a bulk mailer or some other form of printed material. Their purpose is to give the recipient enough information about the community to abate his most obvious and immediate concerns. If interest is aroused sufficiently, the reader may call or write requesting greater detail at which time the community fact book provides necessary data.

A community fact book for Leupp should contain at a minimum those elements listed in the outline on the following pages.

#### COMMUNITY FACT BOOK: PROPOSED CONTENTS

#### 1. Location and Climate

#### a. Location

- (1) Historical narrative
- (2) Geography and topography
- (3) Location map
- (4) Photographs

# b. Climate, Weather and Environmental Conditions

# (1) Means and Extremes

- (a) Temperature
- (b) Humidity
- (c) Precipitation
- (d) Wind directions and Velocity
- (e) Percent of sunshine days

# (2) Climate

- (a) Climate zone
- (b) Narrative and/or illustrations describing unusual or unique climatic features

#### (3) Environmental conditions

#### 2. Population, Economy and Markets

#### a. Population trends and characterisitics

- (1) Census of population information
- (2) Composition of population
  - (a) Race and ethnic characteristics
  - (b) Age and sex groupings
  - (c) Educational levels
  - (d) Income distribution

#### b. Economy

#### (1) Growth Indicators

- (a) Meter connections
- (b) bank statistics
- (c) Retail sales
- (d) Assessed valuations
- (e) Employment data including wage and salary information

- (2) Summary Economic Base Analysis
- (3) Recent Developments
  - (a) New Industry or Commerce
  - (b) Closing of Industry or Commerce
  - (c) Economic Impact of Proposed Developments
- c. Market Characteristics
  - (1) Retail trade area
  - (2) Wholesale and distribution industry
  - (3) Regional Markerts served from Leupp
  - (4) International trade potential Twin Plant Concept
  - (5) Freeport legislation
- 3. Labor Force and Labor Regulations
  - a. Employment Statistics
    - (1) Nonagricultural and other employment
    - (2) Labor Surveys
      - (a) Male labor force
      - (b) Female labor force
      - (c) Potential labor force(d) Skills available in labor force
  - b. Typical wages
  - c. State Legislation Relating to Labor
    - (1) Right-to-Work
    - (2) FEPC and Other Labor Legislation
    - (3) Wage and Hours Regulation
  - d. Work Stoppage Statistics
  - e. Unions in Area and Membership
- 4. Government and Taxation
  - a. State and Local Government
    - (1) City Government Structure and Finances
    - (2) County Government Structure and Finances
    - (3) Special Districts
    - (4) Federal Agency Operations in Area
    - (5) Police, Fire and Other Public Safety Agencies
  - b. Taxation
    - (1) Local taxes affecting business

- (2) State taxes affecting business
- (3) Special District Taxes
- (4) General Business Texes, Ad Valorem and Personal Property taxes

### 5. Community Facilities

#### a. Education Facilities

- (1) Public School System
- (2) Private Educational Facilities
- (3) Colleges and Universities
- b. Parks, Recreation and Tourist Facilities
- c. Medical and Hospital Facilities
  - (1) Number of hospitals and hospital beds
  - (2) Number of physicians, dentists and other medical professionals
  - (3) Special treatment programs and facilities
- d. Religious organizations and facilities
- e. Civil, fraternal, professional and social organizations
- f. Cultural activities and facilities

# 6. Utilities and Transportation

- a. Utility Services and Rates
  - (1) Water Domestic, industrial, fire
  - (2) Sewer Service and treatment
  - (3) Natural gas service and capacities
  - (4) Electrical service
  - (5) Telephone and telegraph service

#### b. Transportation

- (1) Highway network
- (2) Rail service
- (3) Air service
- (4) Motor freight service
- (5) Bus service

# Manufacturing Activities and Natural Resources

- a. Directory of business and manufacturers
- b. Agricultural activity

(1) Single Family Housing

(2) Multi-family housing

- (3) Vacation of Second Home developments
- (4) Building activity projections
  - (a) Residential
  - (b) Commercial and Industrial
  - (c) Institutional and Public
- d. Zoning, Building Codes, Environmental Considerations, and other regulations governing development.

It may appear that this proposed list of contents overlaps and to some degree duplicates the listing of information for the Leupp community information file. On points of information this may be so, but certainly not with regard to format. The fact book should be well structured as to the sequence of topics, illustrated and well prefaced and written. The information file may consist of reports, cards, map drawers or computer tape and it should be integrated with other Navajo statistics.

As part of a development program a "Leupp Community Brochure" may complement the Fact Book. Such a brochure should be for bulk dissemination and should be given careful consideration to the following items - purpose, theme, audience, expected response, and cost.

It is recommended that a minimum of verbiage and an abundance of photographs be used in the community brochure. Care should be taken to avoid using information in the brochure which may become obsolete.

The brochure should include an address and phone number where an individual can write or call for additional information.

#### C. PREPARATION

A prime prerequisite to successful industrial development is being ready to accommodate new industry. Being ready implies the existence of an organization to handle industrial prospects, the existence of industrial sites, and a capacity to react quickly to any of several requirements of an industrial prospect. The responsiveness of a development organization to an industrial prospect is enchanced by having a park available for occupancy.

The design and layout of alternative industrial park designs for Leupp are shown in detail in chapter VIII. It is essential that minimum developments be completed soon so that prospects can be attracted to at least a partially developed facility. In addition to development of the park itself, it is often useful to provide additional improvements which make the area more attractive to potential prospects. Housing development, schools, utilities and roads are some that should be considered.

To accomplish the above requires detailed planning on the part of the Tribal Office of Program Development, proper funding procedures for industrial park development, and detailed but functional coordination between the various Tribal departments involved such as

NTUA, the Navajo Tribal Housing Authority, Office of Navajo Land Administration and others.

This report believes that, barring unforeseen political development the Navajo Tribe has the staff, the organization and the experience to successfully develop and implement an industrial development of Leupp provided the recommendations of this study are closely followed.

Already, organizational tools and industrial development programs have been established as outlined in the Navajo Tribe's OEDP:

1. Overall Economic Development Goal: A primary goal of the Navajo Nation is the efficient development of a viable Navajo economy, which will afford the Navajo people the maximum opportunity for choice of both style and standard of living and establish their self-sufficiency as individuals and as a nation.

Restated in economic terms, the Navajo economic development goal is the efficient development of a diverse and dynamic economy, capable of returning maximum employment and income benefits from industrial development to the Navajo people.

2. The Office of Program Development: Development Section:
In order to realize this goal, the Navajo government has established
the Office of Program Development as the regional authority responsible
for comprehensive planning and implementation of the development
program.

The Office of Program Development consists of three sections:

- (a) The Office of the Executive Director, which provides administrative, fiscal and legal support to the Office;
- (b) The Planning Section, whose purpose it is to create, and to secure compliance with, comprehensive plans for development of the Navajo Nation;
- (c) The Development Section, whose purpose it is to implement those plans by developing the Reservations' potential for industrial, commercial, tourist and other economic activity.

(The Development Section is also responsible for coordinating its efforts with those of other Tribal offices and enterprises involved in implementing economic development such as: The Office of Minerals Development, Navajo Agriculture Products Industries, Navajo Forest Products Industries, Tribal Recreation and Resources Departments, and so forth.)

3. <u>Development Section Staff</u>: The staff of the Development Section consists of a director, an economic development coordinator and two secretaries. In addition, a consultant is on loan to the Section from the National Savings and Loan League to develop a Navajo Savings and Loan Association under a contract paid for by the BIA. The Planning Section works closely with the Development Section, providing them with planning and research support. The Office of the Executive Director provides the Section with administrative, fiscal, and legal support.

A recruiting effort is now underway to obtain two Economic

Development Representatives and one additional Economic Development Coordinator.

Position descriptions for staff of the Development section follow.

### 4. Industrial Development Program:

- a. <u>Goal</u>: To increase employment opportunities for the Navajo people in modern, wage earning occupations, on the Reservation; to increase Navajo income and upgrade Navajo skills.
- b. <u>Basic Parameters</u>: Unemployment on the Reservation is estimated to be 50% or more and there is a large segment of the population willing to work if given the opportunity.

The Navajo Nation can provide attractive industrial locations for industry for the following reasons:

- (1) Access to energy sources
  - (2) Lower tax structure
- (3) Long term leases
  - (4) Large, homogeneous, trainable work force
- c. <u>Accomplishments</u>: During the past year (1974) over 125 companies were contacted in attempts to solicit their expansion on or relocation to the Navajo Reservation.

Contract work was obtained for existing Reservation manufacturers from AMPEX, NCR, Polaroid and Sperry Univac, and Hewlett, Packard & CO., a manufacturer of electronic apparatus has

located at Leupp and is in operation.

A manufacturer of neon signs may locate in Shiprock sometime during 1975.

# d. Objectives and Activities:

Objective I - To develop local industry based upon present and future comparative advantages of the Navajo Reservation.

Work Activity - Promote industrial activity with linkages to Navajo natural resource base and promote local manufacturing industry satisfying internal demand.

<u>Objective II</u> - To attract industry to the Reservation to  ${\sf provide}$  new employment opportunities.

Work Program - Determine which industries are compatible with Reservation conditions, and desireable tenants in terms of short and long-term growth potential, labor intensity, skill level of labor needed, wage levels, size of plants, and possible forward and backward industrial linkages. (Of which this report is a part.)

Promote the Reservation as an industrial location through advertising in trade journals and other periodicals, and by sending out industrial brochures to prospective industrial clients. Establish face-to-face contact with potential industries, promoting the Navajo Nation with a team of professional recruiters, responsible for geographic sections of the

Research and evaluate prospective clients' offers, i.e.,
obtain and analyze financial data on individuals and
companies and their reasons for locating on the Reservation.

Follow through with prospective clients, researching more thoroughly locational data that might be needed and providing package requested, i.e., financing, facilities, manpower, etc.

<u>Objective III</u> - To promote industrial development consistent with the growth center strategy outlined in the  $\underline{Overal1}$  Economic Development Plan.

<u>Work Program</u> - Promote first: Shiprock, <u>Leupp</u> and Fort

Defiance as prospective locations; second, make known

other sites such as Shushbetoh, Mexican Springs, etc.

Objective IV - To make sure that all proposed industrial development activity is consistent with the desires of the Navajo People.

Work Program - Apply Planning Section's "Cost/Benefit
Analysis" to each proposed project in order to determine
social costs and environmental impact.

(It is prudent at this point to mention that what is on
the "benefit" side of the ledger to the Navajo industrial
promoter may be on the "cost" side to someone else. A
clear understanding of and a candid approach to this
problem will alleviate much friction during the development
and funding procedure.)

#### D. RECRUITMENT

Using the generic listing of industry groups whose locational criteria best match the Leupp area, and upon completion of the preliminary activities described above, the next step in the industrial recruitment procedure is to locate specific companies engaged in these general manufacturing activities who might consider locating in the Leupp industrial park.

Prospective firms may be identified through several published sources which list manufacturing firms of various types. These sources can be used in conjunction with the generic list provided in this report to identify their principal products by Standard Industrial Classification Codes include:

<u>Dun and Bradstreet Report</u>, Dun & Bradstreet, Inc., 99 Church Street, New York, New York 10007

Poor's Register of Corporations, Directors, and
Executives, Standard & Poor's Corporation,
345 Hudson Street, New York, New York 10014

Thomas Register of Manufacturers, Thomas Publishing
Co., 461 Eighth Avenue, New York, New York 10001

Moody's Industrial Manual, Moody's Investors Service, Inc., 99 Church Street, New York, New York 10007

Names and addresses of key personnel can be obtained from some of these publications. Other sources of information on manufacturers are usually published by the Chambers of Commerce or similar organizations in larger communities. These sources can be purchased to obtain the names and addresses of firms located in particular communities. From these sources a mailing list can be developed. Once the mailing list is created, infor-

mation should be developed on each of the firms on the mailing list.

Corporations announcing plans for expansion, expenditures for a new plant and equipment, or plans to open new sales and marketing outlets are frequently identified in sources such as: <a href="Dun's Review">Dun's Review</a>, <a href="Barren's">Barren's</a>, <a href="Forbes">Forbes</a>, <a href="Business Week">Business Week</a>, <a href="Wall Street Journal">Wall Street Journal</a>, <a href="The Journal of Commerce">The Journal of Commerce</a>, as well as local media including newspapers from key cities.

Once mailing lists have been created, efforts then should be made to establish contact with firms on the list. Some communities write personally typed letters to the chief corporate executives of selected firms enclosing with these letters a copy of the community brochure and a business reply post card asking questions such as:

- 1. Is your company planning an expansion in the near future? YES \_\_\_\_\_ NO\_\_\_\_
- Is Leupp and the Navajo Reservation in a general geographic area which might be considered by your company for a plant location?
   YES NO NO
- 3. May we provide you with additional information on Leupp?  $\underline{ \text{YES} } \underline{ \qquad } \text{NO} \underline{ \qquad } \underline{ \qquad }$
- 4. Who in your organization should receive plant location information?

When using blanket mailing, response forms should be number coded to identify the respondent in the event complete information is not provided by the prospect. Direct mail programs should seek to insure that some piece of literature with respect to Leupp crosses each executive's desk at least twice a year. New names should be added to the mailing list as soon as they are developed and names should be dropped on request.

Once contacts have been developed, a relationship can be established with the prospect either via letter, telephone or through personal visits.

Many industrial development programs use advertising in national or regional publications and displays at trade shows as another means of making contact with prospects. These techniques are expensive and should be evaluated carefully in light of available funds before being tried and should be done only in selective market areas.

The tribal office of Program Development should also extend its recruitment efforts to the nearby major metropolitan areas including: Albuquerque, Denver, El Paso, Phoenix, Salt Lake City and Tucson. While it may not be practical to think of attracting major plants from these communities to Leupp, it is possible that companies in these metropolitan areas might locate satellite plant operations in Leupp.

### E. POINTS OF EMPHASIS

During the recruitment process development personnel of the Tribe as well as contents of pamphlets, flyers and fact books should emphasize the attributes which make the Navajo Reservation and Leupp superior locations for some firms.

 <u>Lease Agreements</u>: Flexibility and individual treatment of clients with regard to site and building leases are perhaps the most important attributes of an industrial location on Navajo land.

The Tribe can move in almost any direction to satisfy the particular requirement of each firm.

Although land leases of 45 to 55 years duration are preferred whenever a client builds his own building, the Tribe can agree to a 99 year lease if required. If the Tribe builds the building, it prefers leases long enough to amortize its investment and if possible get at least the going premium interest rate at the time the lease is signed. Again, however, the Tribe is flexible in this request.

- <u>Taxes</u>: On the Reservation a firm pays no property taxes or inventory taxes and consequently, these items can be deducted directly from any firm's annual costs.
- 3. <u>Subsidized Job Training</u>: Several Tribal and Federal education programs can provide considerable funds toward pre-job training and toward a portion of a firm's payroll even after a person is hired. The Tribe will, for instance, pay all training costs while an individual is learning skills required by a firm and under the OJT, (On the Job Training Program) the Tribe will pay half of the going salary for a given period of time which could be for one year or less.
  - a. "Navajo Education With Industry Program" This program is fully funded by BIA and administered by the Navajo Tribe. It involves the training and development of a limited number of personnel who are moved to a firm's central facility for a 1-year period before activation of the on-Reservation facility. The objective is to graduate people from the program who, as

a result of this training, will be capable of providing firstline leadership and day-to-day instruction in their functional area to the work force at the production facility.

b. "Concentrated Employment Program" - The Concentrated Employment Program, which is fully funded by the Department of Labor and administered by the Navajo Tribe, provides training in job orientation and vocational skills. The objective of this program, which is conducted on the Navajo Reservation, is to provide pre-employment training to personnel who have a limited background or no background in a given skill and to make them proficient in that skill.

Participants spend 6 or more weeks in the program, depending upon individual background and the demands of a particular skill.

c. "Employment Assistance Program" - The Employment Assistance Program is an on-the-job training program that is implemented after the personnel report on the job. In this program the employee is given continued instruction in the application of his skill, as well as the necessary training to increase his versatility. Employee progress is continuously evaluated to determine additional training needs or completion of participation in the program, as appropriate. This program is funded by the BIA and provides compensation for 50 percent of the employee's entry level rate for a period up to 24 months per individual.

In the last few years manpower-training programs have been spending from \$5 million to \$6 million a year in the Navajo area. Higher-education expenditures by Tribal and Federal agencies and by private parties add another \$2 million or more annually.

During recent years, more than 6,000 Navajos have been entered in these programs and most of them completed the designated training in their field.

#### F. FINANCIAL RESOURCES:

The primary financial resources potentially available for development of basic facilities at Leupp are summarized as follows:

- 1. <u>Tribal Appropriation</u>: Although Tribal funds are limited, financial support for at least a part of the basic development program is available from Tribal funds. Local chapter representatives on the Tribal Council should pursue this source of required "local" funds.
- 2. The Economic Development Administration under the authority of the Public Works and Economic Development Act of 1965 has financially participated in the development of industrial sites and related facilities where such development has been shown to provide economic benefit to a designated area, primarily in terms of creating employment within the area.
- Under the Airport and Airway Development Act of 1970 the Federal Aviation Administration of the Department of Transportation may

make grants-in-aid to political subdivisions for the development of public-use airports. Joint funding between the FAA and EDA have been made for development of airports related to industrial parks.

- 4. The Bureau of Indian Affairs: Numerous loan and grant programs under this agency may appropriately apply to assisting in the Leupp program in the area of housing, roads and bridges.
- 5. The Department of Health, Education and Welfare, under the Indian Sanitation Facilities Act, can assist in the provision of water and sanitary waste disposal facilities required at Leupp.

#### G. CONCLUSION

The Navajo Tribe has a proven ability to run a reasonably effective industrial development program and the Tribe's industrial development staff contains experienced and capable people. For this reason, the implementation problem on the Reservation is the reverse of what it usually is in small towns across the country; in most small industrial development cities the local groups lack experienced personnel, funds, a development program, a site ready for development or a site plan. They have, however, a developed community.

The Navajo Tribe on the other hand, has the land, the experience, the staff, the funds, a program and now, a preliminary site plan, but lack sufficient community and infrastructure developments at Leupp. Housing, parks, commercial facilities, utilities and roads must, therefore, be built to compliment the industrial park. Such a park with its daily activities cannot exist in a complete vacuum.

In this context, it may aid the successful industrialization of Leupp if Leupp were split off from the Tuba City Agency and became a new agency headquarters. Many of the community developments would then follow rather naturally.

Finally, the development staff of the Tribe must take care to prevent competition internally among the various Navajo industrial parks. An industrialist, quite obviously, would prefer to locate in or near a town of some social and economic maturity and when given identical treatment in all Tribal industrial parks, Leupp may not be selected. To make Leupp a successful industrial location, therefore, requires:

- 1. Complete first phase industrial park developments.
- 2. Minimum necessary community developments.
- An implementation program which emphasizes Leupp and which is designed to carry out the priorities of the OEDP.

#### H. CONTRACTOR'S FOLLOW-UP IMPLEMENTATION

Gordon Herkenhoff and Associates, Inc. will provide twenty (20) man-days of follow-up implementation over a six-month period following the acceptance of the final report under this contract, provided that all work under this contract shall be completed by January 31, 1976.

The labor mix of the twenty man-days will be similar to the labor mix during the study effort and the contractor will endeavor to aid Tribal personnel in finalizing the industrial park master plan, a balanced promotion campaign and with funding applications both for the park and for community developments.



## APPENDIX 1

INADEQUACY OF THE DATA BASE



The following are selected paragraphs from "Navajo Research and

Statistics Center - Proposal Abstract", and should serve to indicate
the relative state of statistical information about the Navajo Nation.

"...The Navajo Nation is embarking on a long range, far reaching program, designed to provide a selfsustaining economic base for Navajo Society.

In order to develop precisely stated development goals and specific plans for achieving these goals, there must exist a solid base of accurate information. The need for a comprehensive information system becomes evident when one considers the following..."

## "...1. An Adequate base of reliable information is not now available.

Reliable statistical information needed for many areas of planning is now inadequate. A primary example would be demographic statistics. Data concerning the Navajo population is presently only available in a generalized form whose reliability decreases as one attempts to draw from it population density and characteristics at the smaller scales. No reliable demographic information exists concerning any of the communities in the Navajo Nation. Such information should include total community population, number of households, number of housing units, average family incomes and job skills - to name a few...."

"...Some needed statistical information simply does not exist at all. Thus, nowhere are statistics available regarding capital investment in Navajo agriculture, regarding Navajo savings, regarding consumer goods sales to Navajos and many other basic economic factors.

Moreover, statistics which are available are often contradictory or may appear to be contradictory as the statistical universes are not comparable. The following data demonstrated the discrepancies in income and population statistics determined by the Bureau of Indian Affairs and the U. S.Census:

On-Reservation Navajo Pop., 1970	126,265	<u>U.S.Census</u> 64,675
Navajo per capita Annual income, 1970	\$831	\$740

NOTE: The U. S. Census does not consider Eastern Navajo Agency (one of five administrative sectors of the Reservation) as on-Reservation. This demonstrated different statistical universes.

However, total Navajo population, including off-Reservation persons, determined by the Census is 96,734. This demonstrates significant underenumeration..."

## "...2. There is no central place where various data and reference materials are available.

Despite the fact that there is insufficient organized information, the little planning of information gathering which does take place is often sporadic and shallow in depth and lacking in direction. Thus, information is often scattered among numerous agencies from which it is not always forthcoming due to a lack of knowledge, misunderstanding or a competitive attitude that often prevails between the agencies. Clearly, there is now no way of finding out either what has been done or of determining what is needed. More important, essential development planning tasks are being done in a vacuum -without the interdisciplinary inputs necessary to achieve comprehensiveness. For, without a centrally organized information system, tribal planners have great difficulty in synthesizing what is obviously interconnected information, for example: the level of educational attainment and manpower requirements for economic development, or the level of economic development and educational aspirations.

This lack of information and communication very clearly points out the need for a joint, cooperative planning effort whose basic purpose is the increase of communication among the participants as to what each is doing..."

# "...3. There is a need to coordinate the research capabilities of interested academic institutions with the research needs of Tribal planners and administrators.

As stated in the Ten Year Plan, Part I, 'in spite of many thousands of studies about Navajos, many essential facts needed for economic development are not known'. The Navajos have been researched to death for often esoteric studies which have been of little benefit to them.

(This situation has been recognized as a problem for all Indians. Stephen Langone, an analyst with the Library of Congress, points out that 'a person with an interest in American Indians can get much more information on subjects such as pottery and legends that he can on income, educational attainment, land, etc. of the American Indian today'. Langone supports his statement with the observation that: 'In the Library of Congress Main Catalog there are -- under the heading Indians of North American -- 12 drawers of cards. Twleve drawers contain approximately 18,000 cards and of this number only 16 cards are under the subheading Statistics and 11 cards under the subheading Census. Yet under the subheading Pottery and Legends there are 103 for the former and 314 for the latter. Under the subheadings Population and Income there are no cards at all. ')

As the Ten Year Plan, Part I, states: 'What certainly is not needed is more studies about Navajos. What certainly is needed is research by Navajos, for Navajo use.'...'

The proposal from which these excerpts were taken was submitted in April, 1974, by the Office of Program Development, The Navajo Tribe in conjunction with Navajo Community at Tsaile.



APPENDIX 2

SOILS INVESTIGATION



Soils investigation on the proposed Leupp Industrial Park was performed during the week of December 4, 1974, by Albuquerque Testing Laboratory. Because of the apparent uniformity of soils throughtout the site, test holes were concentrated in the area recommended for first phase development.

The following test results were submitted by the laboratory for each of the test borings made at the locations shown in Figure  $\,9\,$  on in Chapter VII.





## ALBUQUEROUE TESTING LABORATORY

Phone 505 255-8916 P 0 Rox 4101 532 Jefferson, NE Albuquerque, New Mexico 87108

SUBSCIL INVESTIGATION

PHYSICAL TESTING

INSPECTION

RESEARCH

WEI DING CERTIFICATION

NUCLEAR DENSITY

December 26, 1974

Gordon Herkenhoff & Associates 302 - 8th Street N.W. Albuquerque, New Mexico 87101

Attention: Mr. Oystein Lilleskare

Re: Industrial Park at Leupp, Arizona

Lab Number 2660s

#### Gentlemen:

Transmitted herewith is our FOUNDATION INVESTIGATION REPORT for the above referenced project.

#### INTRODUCTION:

The test borings were made on December 4, 1974 using a Mobile B-61 "Pacemaker" Rotary Drill mounted on a 1965 International 1700 Loadstar, 4 x 4 truck, the drill itself being powered by a Ford Industrial Engine. The test holes were advanced "dry" using 5-1/2" O.D., continuous flight, 5-foot sectional augers. Standard penetration tests were made when feasible in the holes at the time of drilling. The purpose of the standard penetration test is to obtain a measure of the relative density or consistency of the subsurface soils encountered and to obtain samples of the soils and/or rock for visual inspection and laboratory testing.

#### TEST DATA AND RESULTS:

All test borings were made at the locations designated in the field by Mr. Lilleskare. "Boring Log Graphs" of the Test Holes are shown on pages 2 through 4 and depict the subsurface soils and/or rock encountered in the holes along with the results of the standard penetration tests, natural or existing moisture content, dry densities where obtainable, grain size classifications and Atterberg Limit Tests made on typical recovered samples. Notes and Definitions pertaining to the "Log Graphs" are shown on page 5. Conclusions and Recommendations follow.

If any questions should arise concerning the report, please contact our office.

Very truly yours,

ALBUOUEROUE TESTING LABORATORY, INC.



## ALBUQUEROUE TESTING LABORATORY

Page 2

PROJECT: Industrial Park at Leupp, Arizona

Lab No. 2660s Date: December 26, 1974 BORING LOG GRAPH - TEST HOLE NO. 1 & 2 MOISTURE CONTENT% PARTICLE SIZE ATTERRERG DRY DENSITY P.C.F. RESISTANCE DISTRIBUTION % LIMITS % VISUAL Per Foot Per 6" or as Noted DESCRIPTION TEST HOLE NO. 1 Approx. 4" of loose top soil (silty sand) 2.3 28 34 lover fairly hard, (Cuttings 0 td 1-1/2') reddish brown. silty, fine grained sandstone. 50+ 50-4-1/2" 6.6 30 30 Some interbedded sandy shale. 2.9 (Cuttings 3 to 4-1/2') \*4.5! TEST HOLE NO. 2 Reddish brown, interbedded, fairly hard silty fine grained sand 3.8 29 67 stone with some (Cuttings 0 td 4') 2.5 elayey shale. \*Refusal to auger drilling with the equiment used



## ALBUQUERQUE TESTING LABORATORY

PROJECT: Industrial Park at Leupp, Arizona

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ab No. 2660s

ate: December 26, 1974

BORING LOG GRAPH - TEST HOLE NO. 3 & 4

I	UTCHAT		ESIST		K	RE	T.	DIST	RIBUT	ron Z	L	IMITS	% .		1
	VISUAL DESCRIPTION	Per Foot	Per 6" or as	Per Foot	SAMPLER	MOISTUR CONTENT	DRY DENSITY P.C.F.	GRAVEL	SAMD	SILT & CLAY	LIGUID	PLASTIC LIMIT	P. I.		
	TEST HOLE NO. 3	N	0.0	C	1	M	D	R	SAJ	SII	H	PL			
	Reddish brown, very silty, some- what clayey shale and sandstone.	Advanced to the control of the contr				2.7		14 (Cutt	48 ings	38 0 to	5')			_	
5	fine grained sandstone with some interbedded clayey, sandy shale.					2.8	Cuttin	gs 5	to 10	)')					
5	Approx. 6" of loose silty sand top soil over silty fairly hard sandstone. Reddish-brown, silt sandy shale with some thin sandstone laye us.  *Refusal to auger drilling with the equipment used	44	16 28		S	6.7	125	10 7 (Cut:	38 30 cings	63		18	17		



## ALBUQUEDQUE TESTING LABORATORY

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PROJECT: Industrial Park at Leupp, Arizona

Lab No. 2660s

BORING LOG GRAPH - TEST HOLE NO. Date: December 26, 1974 MOISTURE CONTENTS PENETRATION PARTICLE SIZE ATTERBERG Ft. DENSITY P.C.F. RESISTANCE DISTRIBUTION ? LIMITS % SAMPLER TYPE VISUAL Per 6" or as Noted SILT & CLAY DESCRIPTION GRAVEL Depth С TIST HOLE NO. Reddish brown, inter hedded silty fine 4.8 (Cuttings 0 to 2-1/2') grained sandstone and sandy clayey . shale. 2.5 \*Refusal to auger drilling with the equipment used.

## TES AND DEFINITIONS

- PENETRATION RESISTANCE BLOWS PER FOOT USING "A" ROD. 140 LB. HAMMER WITH 30-INCH GUIDED FREE FALL UNLESS OTHERWISE NOTED.
  - N Standard Penetration Resistance (ASTM: D-1586), 2" O.D. split Barrel Sampler C - Continuous Penetration Resistance, 2½" O.D., conical, steel drive point
  - R PENETRATION RESISTANCE, 3" O.D. MODIFIED DAMES & MODRE SPLIT RING SAMPLER

## SAMPLE TYPE

- S STANDARD SPLIT BARREL; 2" O.D. x 1-3/8" I.D.
- C California Sampler; 2-3/8" O.D. Equipped with 2" 1.D. x 4" High Brass Liners R - Modified Dames & Moore Sampler: 3" O.D. Equipped with 2.42" I.D. x 1" high
- BRASS LINERS
- T SHELBY TUBE

### SOIL INDEX PROPERTIES

- M MOISTURE CONTENT, % OF DRY SOIL WEIGHT
- D Density, las per cubic foot computed either by volumetric or displacement METHODS. SOILS CLASSIFICATIONS ARE VISUAL UNLESS ACCOMPANIED BY GRAIN SIZE ANALYSIS AND ATTERBERG LIMITS.
- WATER TABLE IF ENCOUNTERED IS NOTED ON LOG GRAPHS AS =

### UNIFIED SOIL CLASSIFICATION SYSTEM ASTM: D2487

#### COARSE-GRAINED SOIL

### MORE THAN 50% LARGER THAN 200 SIEVE SIZE

W.DO	Eller	DESCRIPTION	MAJOR DIVISIONS
0	GW	WELL-GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LESS THAN 5% - 200 FINES	GRAVELS
	GP	POORLY-GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LESS THAN 5% - 200 FINES	More than half of coarse fraction
	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES, MORE THAN 12% - 200 FINES	is larger than No. 4
	GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES, MORE THAN 12% - 200 FINES	sieve size.
0	sw	WELL-GRADED SANDS OR GRAVELLY SANDS, LESS THAN 5% - 200 FINES	SANDS
	SP	POORLY-GRADED SANDS OR GRAVELLY SANDS, LESS THAN 5% - 200 FINES	More than half of coarse fraction
H	sm	SILTY SANDS, SAND-SILT MIXTURES MORE THAN 12% - 200 FINES	is smaller than No. 4
	sc	CLAYEY SANDS, SAND-CLAY MIXTURES MORE THAN 12% - 200 FINES	sieve size.

## FINE-GRAINED SOIL

### MORE THAN 50% SMALLER THAN 200 SIEVE SIZE

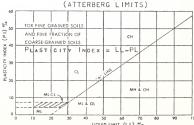
Symbol	Jerio'	DESCRIPTION	MAJOR DIVISIONS
	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY	SILTS
	сι	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	CLAYS Liquid limit
	οι	ORGANIC SILTS AND ORGANIC SILT-CLAYS OF LOW PLASTICITY	less than 50
	мн	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS	SILTS
	СН	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	CLAYS
	ОН	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS	Liquid limit
north	PT	PEAT AND OTHER HIGHLY ORGANIC SOILS	greater than 50

NOTE - Soils with 5 to 12 percent minus 200 fines should be classified with dual symbols.

#### SOIL FRACTIONS

Component		Size Range
Boulders		Above 12 in.
Cobbles		3 In. to 12 in.
Gravel		3 in. to No. 4 sieve
Coarse Gravel Fine gravel	6	3 in. to ¾ in. ¾ in. to No. 4 sieve
Sand		No. 4 to No. 200
Coarse Medium Fine	MS T8	No. 4 to No. 10 No. 10 to No. 40 No. 40 to No. 200
Fines (silt or clay)	s/c	Below No. 200 sieve

PLASTICITY CHART



#### CONCLUSIONS & RECOMMENDATIONS

Based on the five (5) requested test borings drilled on the site; the results of both field penetration tests and laboratory tests made on typical subsurface soils and/or rock, we submit the following opinions and recommendations concerning the foundation design for the proposed construction at the site:

Surface and subsurface soils and/or rock encountered at the test locations
are as shown and depicted on the "Boring Log Graphs", pages 2 through 4.
These soils and/or rock are reddish-brown to brownish-red, sedimentary
deposits of interbedded clayey shales, silty fine sands and silty, fine
grained sandstone.

The soils and/or rock are generally in a <u>dense</u> to <u>very dense</u> state of relative density. Refusal to auger drilling with the equipment used was met in four of the five test borings at the relatively shallow depths of 2.5 feet to 5 feet.

Atterberg Limit tests made on the minus 40 mesh material of the clayey shales and/or sandstones show that the fines of these sedimentary rocks are of medium plasticity and existing field moisture is generally below the plastic limit; therefore, with increased moisture content the shales can be expected to swell to some extent. Evidence of this swelling potential is indicated in the test results from a Confined Swell Test given in the Appendix. With an increased moisture content of 7.1%, the confined swell specimen exerted a swelling pressure of 3096 pounds per square foot.

- It is our understanding from Mr. Lilleskare that contemplated construction at this site will consist of lightly loaded, one story buildings without basements and with "on-grade" reinforced concrete floor slabs. For the contemplated construction, we recommend the following:
  - (a) Foundations could consist of either continuous reinforced concrete footings or "spot" footings combined with reinforced concrete grade beam construction. All foundations should be based below the frost line and at a minimum depth of 2-1/2 feet beneath the present ground's surface or lowest finished adjacent grade. If grade beam construction is used it will be advisable to place a compressible material or to leave a void space beneath the beams to protect them from possible swelling pressures that could be developed in underlying shales, should the shales become wetted or saturated to various degrees.

If structures are to be placed on structural fills, foundations for each individual structure should be based <u>all</u> on compacted fill soils. In addition, the depth of compacted fill beneath bottoms of foundations should be equal to 1/2 of the width or least dimension of the footing but not less than one foot. These compacted fill soils should also extend on all sides of the foundations to horizontal dimensions equal to the depth of the compacted fill beneath the footings. Materials used for structural fills should consist of an approved, pit-run sand and gravel or a well-graded cohesionless soil with a Plasticity Index not exceeding 8. Fill materials should be compacted in thin layers

 $(8^n$  maximum loose depth) at or near optimum moisture content and to a minimum of 95% of Modified Proctor Density (A.S.T.M. D-1557).

For foundations placed either in the native soils or on compacted fill soils, do not exceed a soil bearing pressure of 3000 pounds per square foot.

- (b) "On-grade" slabs should be founded on at least 8" compacted thickness of either of the two (2) materials outlined under (a) above for structural fills. Prior to placing structural fills beneath slabs or footings, the existing subgrade soils should be scarified to a minimum depth of 6", wetted to or near optimum moisture content and compacted to a minimum of 90% of Modified Proctor Density. If floor coverings such as tile are contemplated, they should be of the type that can readily dissipate possible moisture build-up. If wire mesh reinforcement is used in the slabs it will be essential to place the mesh at mid-height of the slab.
- 3. It will be important to <u>provide</u> and <u>maintain</u> positive surface water drainage around and away from exterior walls and to keep soils at and below foundation depths from becoming wetted or saturated to various degrees. Some of the foundation soils of the type found at this site will swell if they become moistened or saturated to various degrees with possible resulting structure heave. To help protect foundation soils at and below foundation levels from moisture intrusions we recommend the following:
  - (a) Keep opened excavations for foundations "dry" and place concrete as soon as practicable after excavations are opened.
  - (b) Provide and maintain positive surface water drainage around and away from the structures.
  - (c) Properly compact all soils around exterior walls, foundations and in utility trenches to a minimum of 90% of Modified Proctor Density.
  - (d) Discourage planting of flowers or shrubbery adjacent to exterior walls unless subsurface drainage is provided for planters or planted areas.
- 4. It is our understanding that the few test borings of this report cover a rather extensive area and are of a preliminary nature for planning purposes. When more detailed information has been established regarding structure locations and loadings, it may be advisable to drill additional test borings to substantiate the recommendations given in this report.

Recommended allowable soil bearing pressure, foundation depths, protection of soils at and below foundation depths and all other recommendations covered by this report are based on the following:

(a) actual subsurface soil and/or rock conditions encountered in the test borings drilled on the site (b) light structure loadings furnished to our laboratory by the architect or engineer.

Any changes or deviations from the recommendations given in this report, in structure loadings, foundation depths or any other factors which could affect or alter the recommendations covered herein, should be brought to our attention before finalization of plans and prior to construction.

Your attention is directed to the fact that only a very small, fractional part of the proposed site area was "opened" and subsurface soils exposed and tested through the test borings. Subsurface soils or rock and their in-situ properties which can materially affect design considerations may change in areas not covered by the test borings. Therefore, if during construction and when excavations for footings are opened, soil and/or rock foundation conditions differ from those encountered by the test borings of this report, our laboratory should be notified immediately for possible revisions to our recommendations.

The Albuquerque Testing Laboratory assumes no liability for the design and structural adequacy of the foundation(s) or as the foundation affects the superstructure. Our only guarantee concerning the project is that our engineering work and judgements given herein meet the standards of our profession at this time.

Respectfully submitted,

ALBUQUERQUE TESTING LABORATORY, INC.

Robert K. Lloyd Registered Professional Engineer

## ALBUQUERQUE TESTING LABORATORY

APPENDIX

#### ALBUQUERQUE TESTING LABORATORY

Lab No. 2660s

Project: Industrial Park at Leupp, Arizona

### CONFINED SWELL TEST: Red Shale Sample

Sample Identification: Test Hole No. 4, depth = 2-1/2 feet

Test Data: Swell Ping Diam. = 1-3/8": Area = 1.485 in. 2

Height = 1.00 inches; Veight = 147.8 grams

Proving Ring = 0.462 lbs per 0.0001 inch

Soil Sample: Height = 1.00'' - 0.244'' = 0.756''

Initial Wt. Soil & Ring = 187.2 grams

After Test, Ut. Soil & Ring = 189.8 grams

Oven dry Soil = 36.9 grams

## Test Results:

### Soil Sample

Vet Density = 133.7 p.c.f.

Dry Density = 125.2 p.c.f.

Moisture (Prior to test = 6.76 %

(After test = 13.82 %

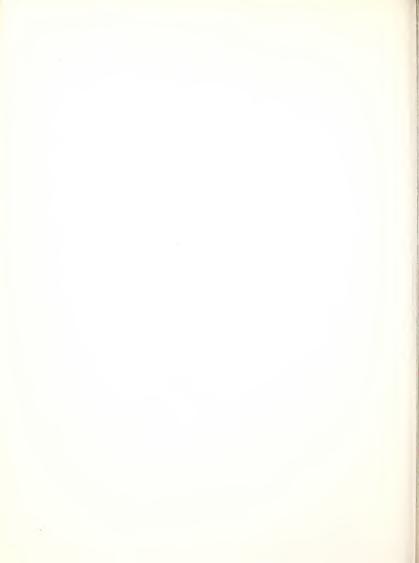
(Increase = 7.06 %

SULLLING

DATE	TIME	PROVING RING (10 <sup>-4</sup> )inches	LOAD (1bs)	STRESS (1bs/in. <sup>2</sup> )
12/13/74	11:35	0	0	0
	11:36	12	5.5	3.7 (533p.s.f.)
11	11:46	18	8.3	5.6 (806p.s.f.)
17	1:23 PM	66	30.5	29.5 (2952 p.s.f.
11	4:20	68	31.4	21.1 (3038 p.s.f.
11	5:05	69	31.9	21.5 (3096 p.s.f.

## APPENDIX 3

A CRITIQUE OF A METHOD NOW USED TO SELECT INDUSTRIES FOR THE NAVAJO RESERVATION



#### COMMENTS:

In September, 1974, a series of "Yes" and "No" answers were computer tabulated with regard to compatibility between industrial requirements and resources at Leupp. This tabulation produced an interesting industrial selection for Leupp, and the following notes of caution appear necessary:

- 1. By going to five SIC digits considerable detail is gained in industry requirements but each particular requirement is not as important as every other. The "yes" and "no" questions reveal nothing about an industry's capability of living with a rather sub-optimum overall input mix provided a few basic inputs are satisfied. A vast number of industrial groups are thereby lost from the list.
- 2. Conversely, an industry may have one (1) absolute requirement while being flexible on all others. The scoring process used here may still put this industry in a high compatibility class for Leupp when in fact the process cannot economically be carried out at Leupp. This, among others, is the case with "Liquified Refinery Gases", which has a compatibility rating of 55.5%. But to pipe refinery gases to Leupp for liquification is economically nonsensical.
- Three factors were the most ignored or mistreated in the tabulation:

- a. Labor force compatibility.
- b. Transportation sensitivity on both the input and output sides.
- c. Lack of adequate infrastructure.

It is, for example, uncertain why "Typesetting and Typographic Work", 
"Magazine and Periodical Lithographic Printing", "Surgical Orthopedic and Prosthetic Appliances" appear in the final listing 
because they all need highly trained artists and a close proximity 
to suppliers and markets. Yet all these score over 65% in the 
compatibility rating.

Most heavy intermediate metal products such as "Miscellaneous Carbon Steel Castings" (compatibility 90.4%), "Miscellaneous Gray Iron Castings" (79.2%), "Foundry Machinery and Equipment" (73.2%), "Fuel Fired Industrial Furances and Ovens" (72.0%), "Miscellaneous Stamped and Pressed Metal" (70.1%) and "Fabricated Steel Plate (65.6%) and ten other categories are all better off economically near steel production and heavy industrial centers.

It is further doubtful that anyone would locate a softwood veneer plant at Leupp because of the distance to adequate timber supplies, and "Weaving, Finishing and Spinning of Cotton Textiles" needs a moist, temperate climate, considerable quantities of water and is a fairly heavy polluter.

Finally, electronic, optical and electric equipment manufacturers received rankings which often were below those of heavy industrial machinery production. This seems to reverse all logical conclusions derived from infrastructures and transportation considerations.

In conclusion, the basic <u>shortcoming</u> of this selection method is the "Yes" and "No" approach which takes no account of the weighted importance of different factors and does not weed out industries on the basis of "absolutely necessary local inputs" which Leupp may not have.

The basic error in the application of the selection method is the use of five digit SIC groupings which due to the peculiarities of specific industries yields an almost arbitrary selection and ranking. Why for instance does "Files, Rasps, File Accessories and other Hand Tools" score only 50.5% and "Metal Cutting Type Machine Tools" scores 85.9%? The first group is No. 120 in a listing of 121 groups; the last group of the three is No. 5.

No more than three SIC digit groups should be used for a more general, but reasonably reliable, ranking of industry. Only when a specific variable needs investigation should more digits be used.

The ranking of industries as produced by this method is shown on subsequent pages for comparison and reference purposes.

## COMPATIBILITY RATING BETWEEN LEUPP RESOURCES & INDUSTRIAL LOCATION CRITERIA

SIC CODE	INDUSTRY	PERCENT COM- PATIBILITY	GRADE	
33232	Misc. Carbon Steel Castings	90.4	А	
36211	Fractional Horsepower Motors	86.2	В	
33610	Aluminum and Aluminum Base			
	Alloy Castings	82.1	В	
27611	Manifold Business Forms Con-			
	tinuous	80.7	В	
35451	Small Cutting Tools for Machine			
	Tools	85.9	В	
34616	Metal Commercial and Home Can-			
	ning Closures	81.8	В	
38421	Surgical Orthopedic and Pros-			
00,01	thetic Appliances	80.6	В	
33214	Misc. Gray Iron Castings	79.2	C	
36112	Test Equipment for Testing	77.2	· ·	
30112	Electrical Radio and	77.0	С	
35415	Lathes	73.9	C	
35370	Industrial Trucks Tractors Trailers		C	
33370	Stackers	77.6	С	
35991	Carburetors Pistons and Piston	77.0	C	
33771	Rings and Valves	76.5	С	
35592	Foundry Machinery and Equipment	73.2	C	
34941	Automatic Regulating and Control	13.2	C	
34941	Valves	73.0	С	
35672	Fuel Fired Industrial Furnances	75.0	C	
33072	and Ovens	72.0	С	
27612	Manifold Business forms Unit Set	71.8	C	
32291	Table Kitchen art and Novelty	/1.0	C	
32291		71.1	С	
25/02	Glassware	70.4	C	
35482	Power Driven Hand Tools	70.4	C	
34618	Misc. Stamped and Pressed Metal	70.1	0	
00561	End Pro	72.8	C C	
22561	Warp Knit Fabrics			
33911	Drop Upsel and Press Steel Forgings		C C	
27910	Typesetting and Typographic Work	71.7	C	
35731	Electronic Data Processing Mac-	70.0	0	
0.6701	hines	70.9	С	
36794	Coils Transforming Reactors and	70.0		
	Chokes for Elec.	70.2	C	
35316	Mixers Pavers and Related Equipment	68.9	D	
38111	Aeronautical Nautical and Naviga-			
	tional Instruments	68.8	D	
35319	Misc. Construction Machinery	67.8	D	
35690	Other General Industrial Machinery	67.8	D	

SIC CODE	INDUSTRY	PERCENT COM- PATIBILITY	GRADE
35 663	Other Mechanical Power Trans-		
	mission Equipment	67.3	D
27891	Edition Library and Other Hard		
_, _, _	Cover Book Binding	66.5	D
35857	Other Refrigeration and Air		_
	Conditioing Equipment	65.9	D
34432	Fabricated Steel Plate	65.6	D
35485	Other Metalworking Machinery	65.4	D
27521	Magazine and Periodical Litho-	03	2
-,,,,,,	graphic Printing	65.4	D
35412	Drilling Machines	64.2	D
37991	Automobile Trailers	64.0	D
3 6 3 4 3	Misc. Small Household Electric	04.0	D
30343	Appliances	67.1	D
36113	Other Electrical Measuring Inst-	07.1	D
30113	ruments	66.2	D
35223	Planting Seeding and Fertilizing	00.2	D
33223	Machinery	65.7	D
35453	Other Attachments and Accessories	05.7	D
33433	for Machine	65.5	D
36511	Household and Automobile Radios	05.5	D
30311	and Radio/Phono	65.4	D
28152		65.4	D
35 662	Synthetic Organic Dyes	05.4	D
33002	Speed Changers Industrial High Speed Drives	64.1	D
3 642 6	Other Nonresidential Electric	04.1	Д
3 642 6	and Non Electric L	63.6	D
2/0/5		03.0	Б
34945	Metal Fittings Flanges and Unions	63.5	D
34231	for Piping SY	63.0	_
	Mechanics Hand Service Tools		D D
36792	Capacitors for Electronic Applic.	63.0	D
35362	Overhead Traveling Cranes and	62.9	
20211	Monorail Systems	62.9	D
38311	Optical Instruments and Lenses	62.4	D
33231	Steel Investment Castings all	(1.1	
0/00/	Grades	61.1	D
24326	Softwood Weneer	61.0	D
35318	Scrapers Graders Rollers and Off	60.0	
01201	Highway Trucks	60.9	D
24324	Nonwood Face Plywood	63.4	D
38312	Sighting and Fire Control Equip.	(2.0	
26702	made from L	63.0	D
36793	Resistors for Electronic Applic.	62.9	D
28182	Misc. Acyclic Chemicals and		
	Chemical PR	62.4	D
25221	Metal Office Seating ETC	61.5	D
37910	Trailer Coaches	61.0	D

### Continued

SIC CODE	INDUSTRY	PERCENT COM- PATIBILITY	GRADE
36741	Integrated Microcircuits	60.9	D
33996	Heat Treating of Metal for		
	the Trade	60.9	D
37321	Book and Pamphlet Printing		
	Lithographic Process	60.8	D
35611	Industrial Pumps	60.4	D
38213	Industrial Process Instruments	60.5	D
33577	Magnet Wire	59.9	E
36425	Floodlighting and Other Outdoor		
	Lighting Equipment	59.7	E
36220	General Industry Power Circuit	33.1	11
	Devices and Cont.	59.6	E
36111	Integrating Instruments Elec.	59.3	E
34942	Valves for Power Transfer	59.1	E
7525	Games and Tovs	58.8	E
5 623	Other Roller Bearings Complete	59.7	E
35483	Acetylene Welding and Cutting	33.1	D
75405	Appartus	59.7	E
35221	Wheel Tractors and Attachments	59.5	E
55314	Power Crances Draglines Shovels	27.2	
13314	and Parts and At	59.1	
34460	Architectural and Ornamental	39.1	E
34400	Metal Work	59.1	
33512		59.1	E
3312	Rolled Drawn and Extruded Copper	F.O. (	_
34943	and Copper Bas	58.6	E
,4943	Other Metal Valves for Piping	F 0 /	_
36621	Systems and Equip.	58.4	E
36621	Commercial Industrial and Military		
	Electronic C	58.2	E
28993	Misc. Chemicals and Chemical		
	Preparation	57.9	E
28191	Synthetic Ammonia Nitric Acid		
	and Ammonium Comp	57.4	E
354k4	Grinding and Polishing Machines	56.8	E
35540	Paper Industries Machinery and		
	Parts and Attachments	56.2	E
26217	Unbleached Kraft Packaging	55.9	E
29116	Liquefied Refinery Gases	55.5	E
35361	Hoists	58.3	E
35199	Parts and Accessories for Internal		
	Combustion E	57.9	E
35811	Automatic Merchandising Machines	57.5	E
35671	Electric Industrial Furnances		
	and Ovens	56.9	E

## Continued

SIC CODE	INDUSTRY	PERCENT COM- PATIBILITY	GRADE
35442	Industrial Molds	56.3	E
25223	Metal Office Cabinets and Cases	56.1	E
35481	Rolling Mill Machinery and Equip.	55.6	E
39112	Jewelry Made of precious metals	33.0	ь
	except aluminum	55.4	E
35661	Plain Bearings and Bushings	55.3	E
35442	Presses Including Forgings Presses		E
30796	Construction Plastics Products	54.5	E
35612	Hydraulic Fluid Power Pumps and	34.3	ь
	Motors and Vacu	53.8	E
38611	Still Picture Equipment	53.4	E
33221	Malleable Iron Castings	53.2	E
35418	Mics. Metal Cutting Type	33.2	L
33410	Machine Tools	52.8	
30795	Industrial Plastics Products	52.5	E
33233	Misc, Alloy Steel Castings	55.2	E
35593	Plastic Working Mach and Equip and		E
33333	parts		W1
33572		54.5	E
35351	Copper and Copper Base alloy wire	54.0	E
33525	Conveyors and conveying equipment Extruded Aluminum rod bar other	53.7	E
33323	extruded Sh	F2 0	_
28343		53.2	E
20343	Pharmaceutical Preparations Acting	F.O. O.	_
36410	on Central W	53.0	E
35650	Electric Lamps Bulbs only	52.6	E
03630	Industrial Patterns of Wood Metal		
2/222	etc.	52.4	E
24323	Softwood Plywood	52.4	E
27322	Book and Pamphlet Printing Other		
	Processes	51.7	E
32210	Glass Containers	51.6	E
38714	Watches with Imported Movements	51.3	E
38711	Clocks Clock Movement and Timing		
	Mechanisms	51.2	E
28213	Thermoplastic Resins	50.7	E
22111	Cotton Textiles (Weaving, Finishing		
	and Spinning)	50.1	E
37321	Inboard Motor Boats	52.3	E
35595	Other Special Industry Machinery		
	and Equipment	51.6	E
35551	Printing Presses	51.3	E
34970	Metal Foil and Leaf	51.2	E
38511	Opthalmic Fronts and Temples	50.9	E
34233	Files Rasps and File Accessories		
	and other Hand	50.5	E
35621	Ball Bearings (Complete)	50.0	E



APPENDIX 4
BACKGROUND STATISTICS



TABLE 43

MEAN & MEDIAN AGE OF THE NAVAJO POPULATION
BY SEX & MARTIAL STATUS

	MEDIAN	MEAN
Both Sexes	18.4	24.2
Single	12.3	14.9
Married	40.1	43.8
Widowed	63.6	63.8
Divorced	43.5	46.6
Head of Household	42.4	46.6
Males	18.0	24.0
Single	12.3	14.9
Married	41.9	45.8
Widowed	67.3	68.1
Divorced	43.4	46.5
Head of Household	42.3	46.3
Females	18.8	24.3
Single	12.3	15.0
Married	38.5	42.0
Widowed	62.7	62.8
Divorced	43.6	46.6
Head of Household	42.9	47.5

Source: Navajo Area Population Estimate, January 1, 1972, U. S. Health & Social Services Department.

TABLE 44 SOCIAL CHARACTERISTICS OF THE NAVAJO TRIBE: 1970

RELATIONSHIP TO HEAD OF HOUSEHOLD	
Total populations	96,743
Under 18 years old	51,401
Living with both parents	37,092
Percent of all under 18 years	72.2
Head of Household	18,908
Head of family	16,779
Female Head	3,238
Primary Individual	2,129
Female Primary Individual	1,069
Wife of Head	12,630
Other Relative of Head	59,855
Nonreltaive of Head	2,719
In group quarters	2,631
Inmate of Institution	931
Other	1,700

TABLE 45

ENROLLMENT BY GRADE IN SCHOOLS OPERATED BY THE BIA FISCAL YEAR 1972

	OLAVAM
Grand Total	22,094
Kindergarten	943
Beginners	2,041
First	2,586
Second	2,357
Third	2,141
Fourth	1,927
Fifth	1,878
Sixth	1,466
Seventh	1,274
Eighth	974
Ungrad. Elem.	1,223
Sub-Total Elem.	18,810
Ninth	965
Tenth	819
Eleventh	781
Twelfth	719
Ungrad. Secondary	
Sub-Total Secondary	3,284
Sub-Total Secondary & Elem.	22,094

Source:  $\frac{\text{BIA Statistics}}{1972.}$  On Schools, Annual Report, Fiscal Year,

TABLE 46

COMPLETIONS AND NUMBER OF GRADUATES OF SCHOOLS OPERATED BY BIA
Fiscal Year 1972

Area	High School Graduates	8th Grade Comp	Post Gradu- . ate Comp.
Navajo	609	1,015	
Source:	BIA Statistics, On School	s, Annual Report	Fiscal Year

TABLE 47

INCOME OF NAVAJOS 16 YEARS AND OLDER IN 1969

		MALE	FE	MALE
	TRIBE	ON RESERVATION	TRIBE	ON RESERVATION
Persons	24,447	13,556	25,932	15,214
Vithout Income	6,292	4,002	12,137	7,452.
With Income	18,155	9,554	13,795	7,762
\$1 to \$999 or less	5,734	3,254	6,192	3,572
\$1,000 to \$1,999	2,820	1,547	2,449	1,358
\$2,000 to \$2,999	1,944	991	1,531	701
\$3,000 to \$3,999	1,490	716	1,262	672
\$4,000 to \$4,999	1,530	814	840	484
\$5,000 to \$5,999	1,323	637	637	412
\$6,000 to \$6,999	1,198	708	453	330
\$7,000 to \$7,999	829	372	167	115
\$8,000 to \$8,999	537	266	52	41
\$9,000 to \$9,999	284	71	68	25
\$10,000 to \$10,000	395	138	59	44
\$15,000 or more	71	40	35	8
Median Income	\$2,269	\$1,984	\$1,282	\$1,228
Mean Income	\$3,156	\$2,955	\$2,034	\$2,032

Source: Navajo Census, 1970.

TABLE 48 ESTIMATED POPULATION BY AGE & SEX TUBA CITY AGENCY, JANUARY 1, 1973

AGE GROUP	MALES	FEMALES	TOTAL
0. /	(11	(1/	1 225
0-4	611	614	1,225
5-9	1,693	1,682	3,375
10-14	1,156	2,034	3,990
15-19	1,653	1,755	3,408
20-24	1,408	1,385	2,793
25-29	964	1,043	2,007
30-34	805	871	1,676
35-39	676	831	1,507
40-44	593	647	1,240
45-49	416	487	903
50-54	327	383	710
55-59	245	261	506
60-64	216	252	468
65-69	160	181	341
70-74	98	128	226
75-79	95	63	158
80-84	67	54	121
85-89	44	26	70
90-94	30	19	49
95-99	17	13	30
100-104	4_	9_	13
All Age Groups	12,078	12,738	24,816

Navajo Area Office

TABLE 49

OCCUPATIONS OF NAVAJO POPULATION AND URBAN AND RURAL RESIDENCE

MAJOR OCCUPATION GROUP	TRIBE	ON RESERVATION
Male, employed, 16 years old and over	10,019	4,911
Professional, technical, and kindred workers	1,039	490
Managers and administrators, except farm	348	266
Sales workers	168	91
Clerical and kindred workers	582	371
Craftsmen, foremen, and kindred workers	2,190	1,069
Operatives, including transport	2,344	1,018
Laborers, except farm	1,510	663
Farmers, and farm managers	96	94
Farm laborers and foremen	549	141
Service workers, except private household	1,183	708
Private household workers	10	-
Female, employed, 16 years old and over	6,269	3,428
Professional, technical, and kindred workers	517	319
Managers and administrators, except farm	66	65
Sales workers	188	82
Clerical and kindred workers	1,635	1,039
Craftsmen, foremen, and kindred workers	111	44
Operatives, including transport	1,192	647
Laborers, except farm	54	30
Farmers and farm managers	64	53
Farm laborers and foremen	63	21
Service workers, except private household	1,960	940
Private household workers	419	188

Source: Navajo Census, 1970.



